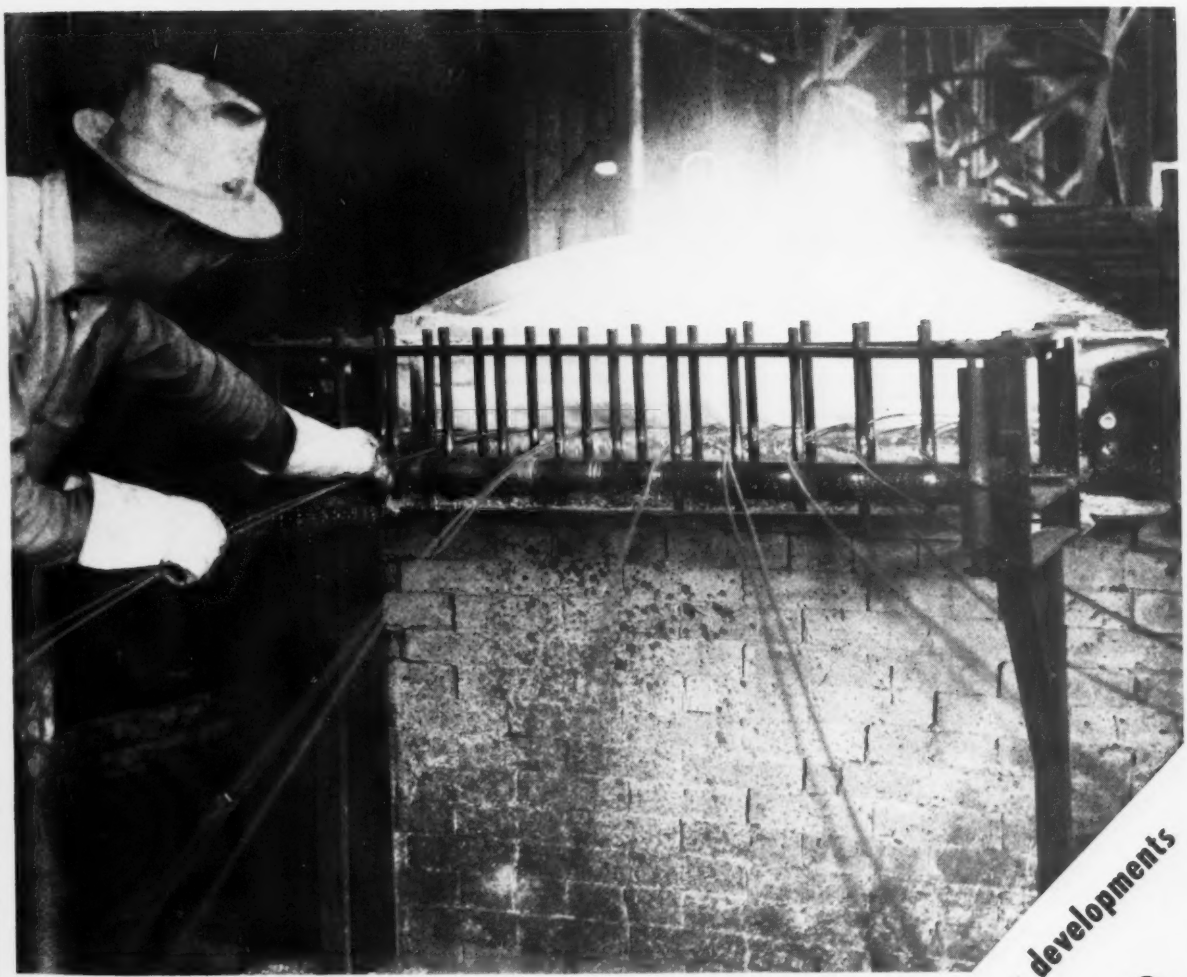
# Western Industry

March 1953

*Patenting, or heat-treating, is next step after preliminary wire drawing in manufacture of wire rope at this Western factory . . . . . page 36*

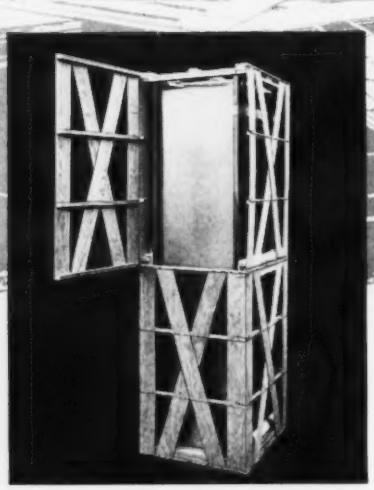


**What automation can do for smaller plants . . . page 39**

**Beating old man obsolescence to the punch . . . page 43**

**A special section on new developments in METALS AND METALWORKING Pages 50 through 120**

*Like giant sewing machines, Cabco's rows of "stitchers" mass-produce wirebound containers at better than eight per minute.*



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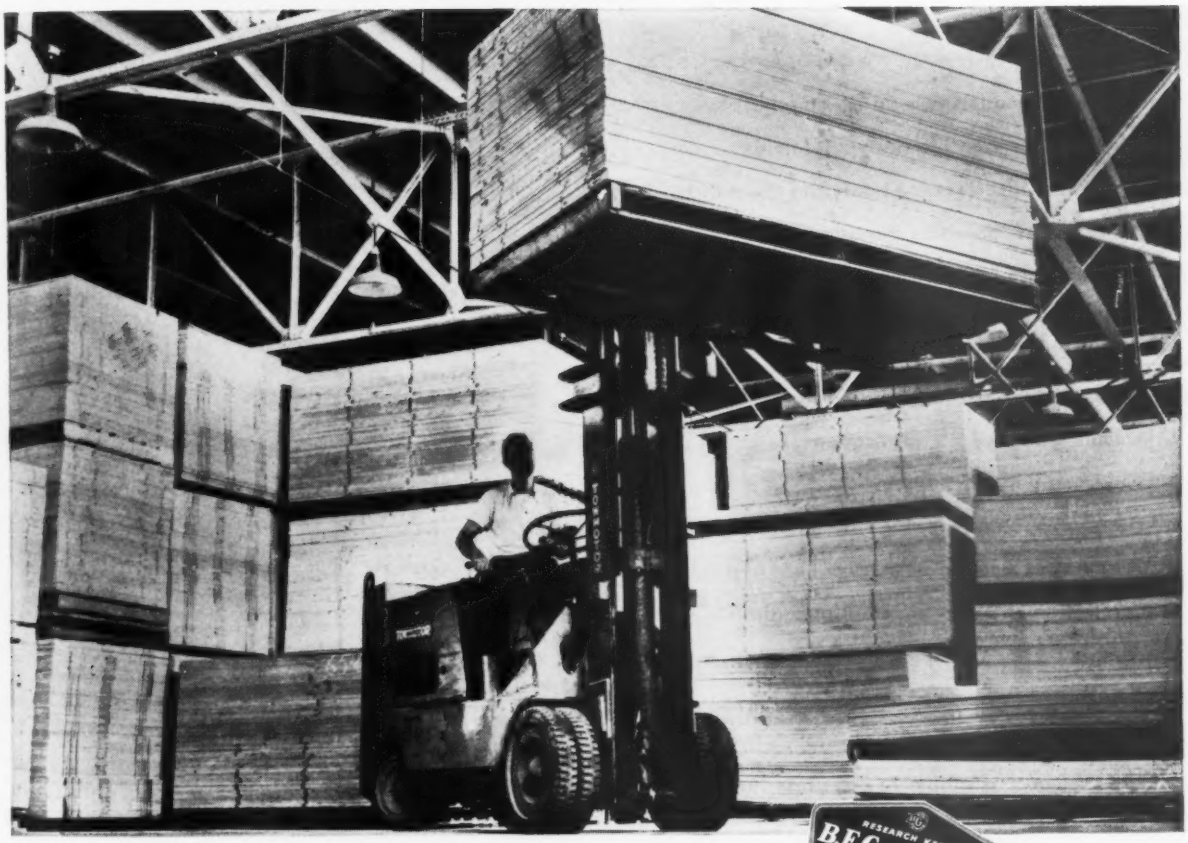

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Western Industry

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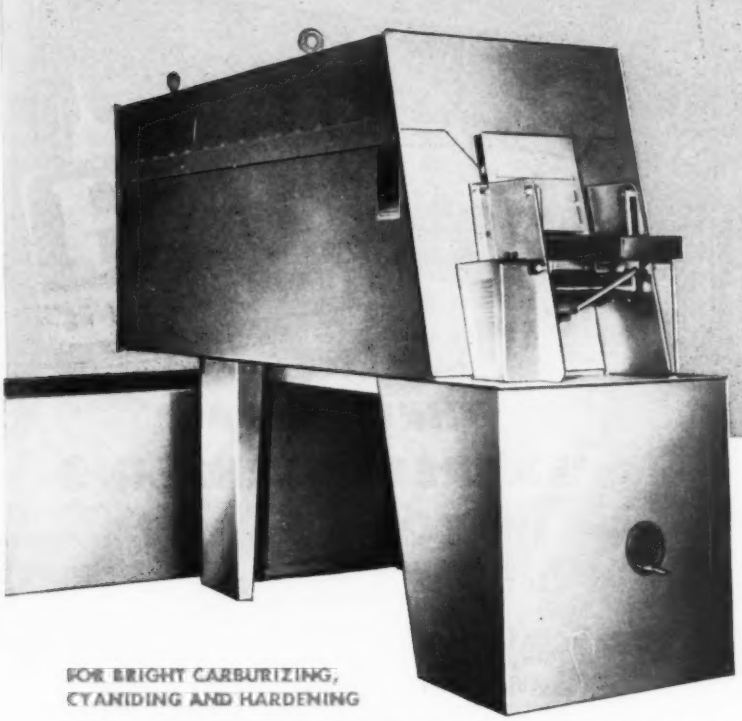

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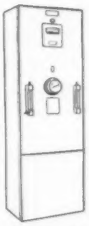

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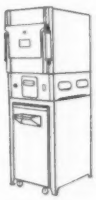

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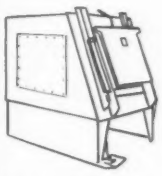

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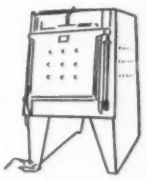

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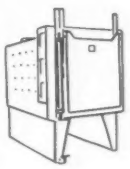

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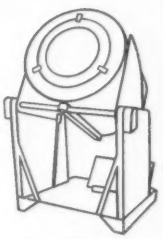

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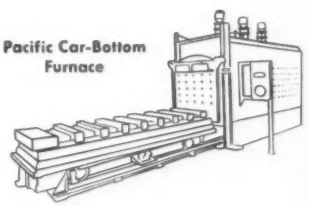

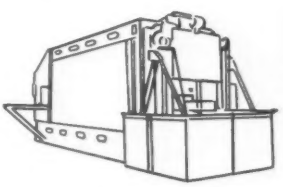

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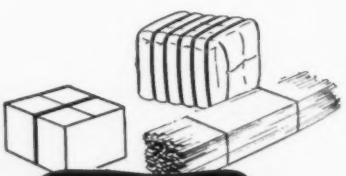

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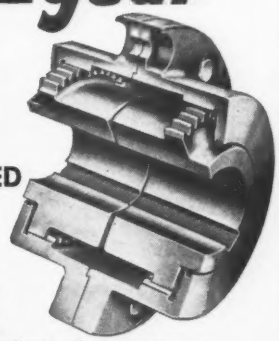

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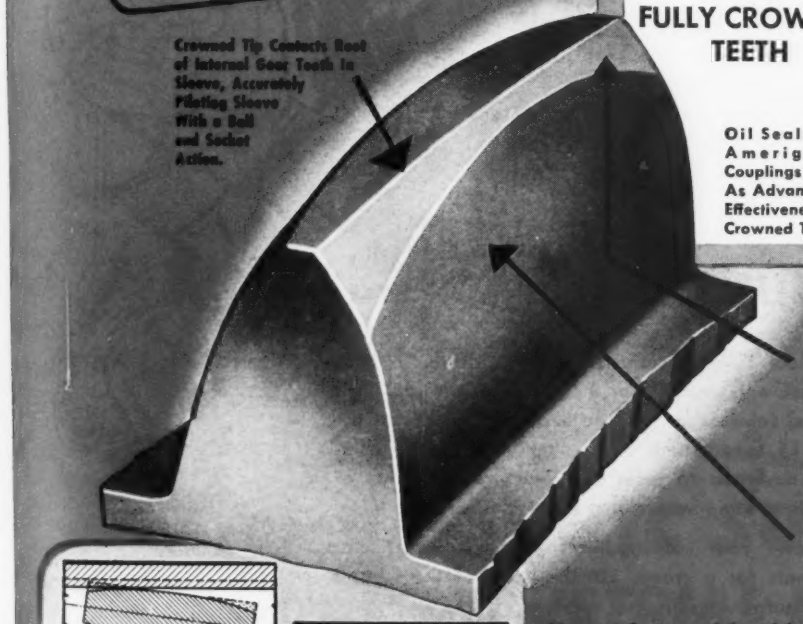
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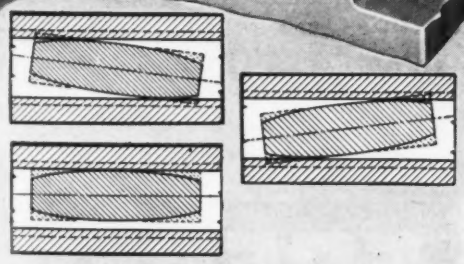

Comparison Of Amerigear Fully Crowned Tooth Design With Gearing Of Conventional Gear-Type Couplings Shows How "End Tooth And Tip" Contact Is Practically Eliminated And Why Greater Freedom Of Axial Movement Is Provided By Amerigear Fully Crowned Tooth Design (dotted lines indicate gear teeth of conventional gear-type coupling).

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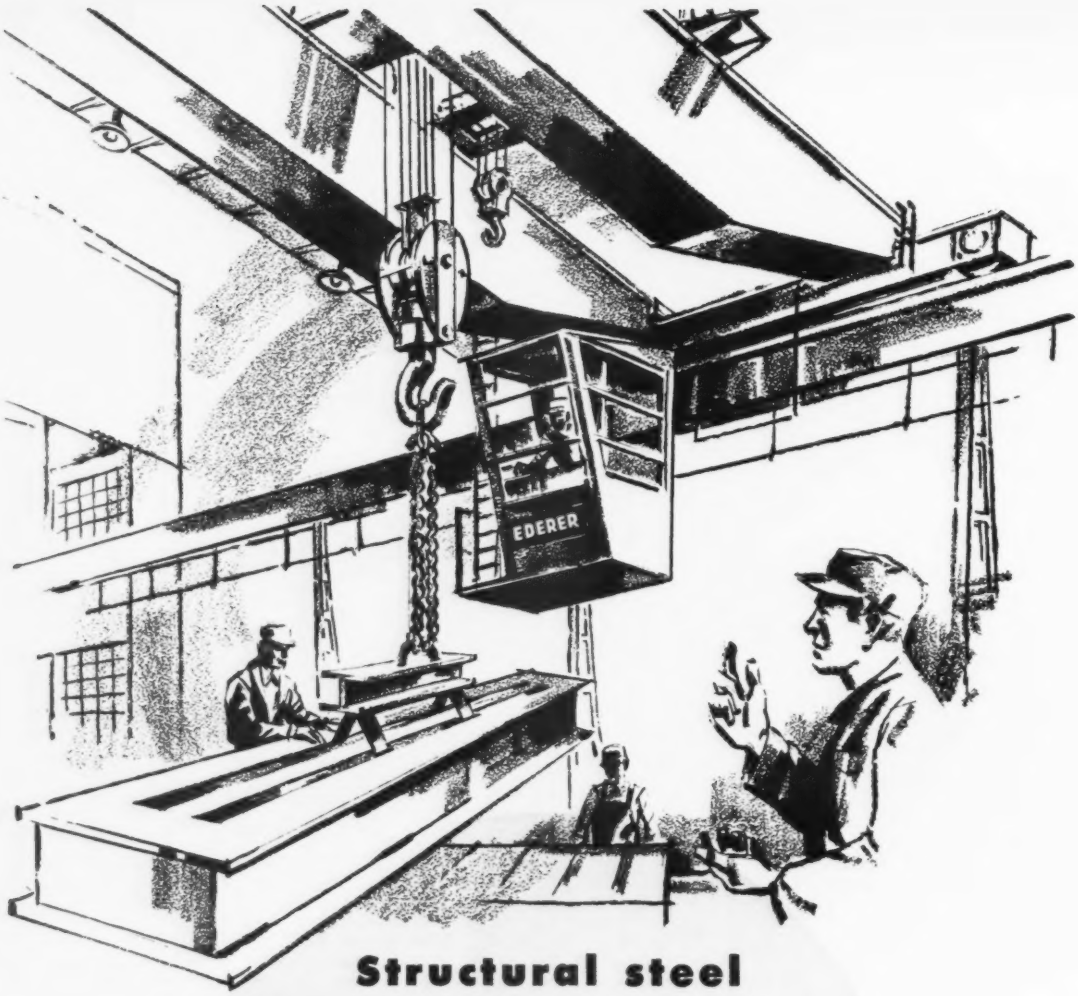


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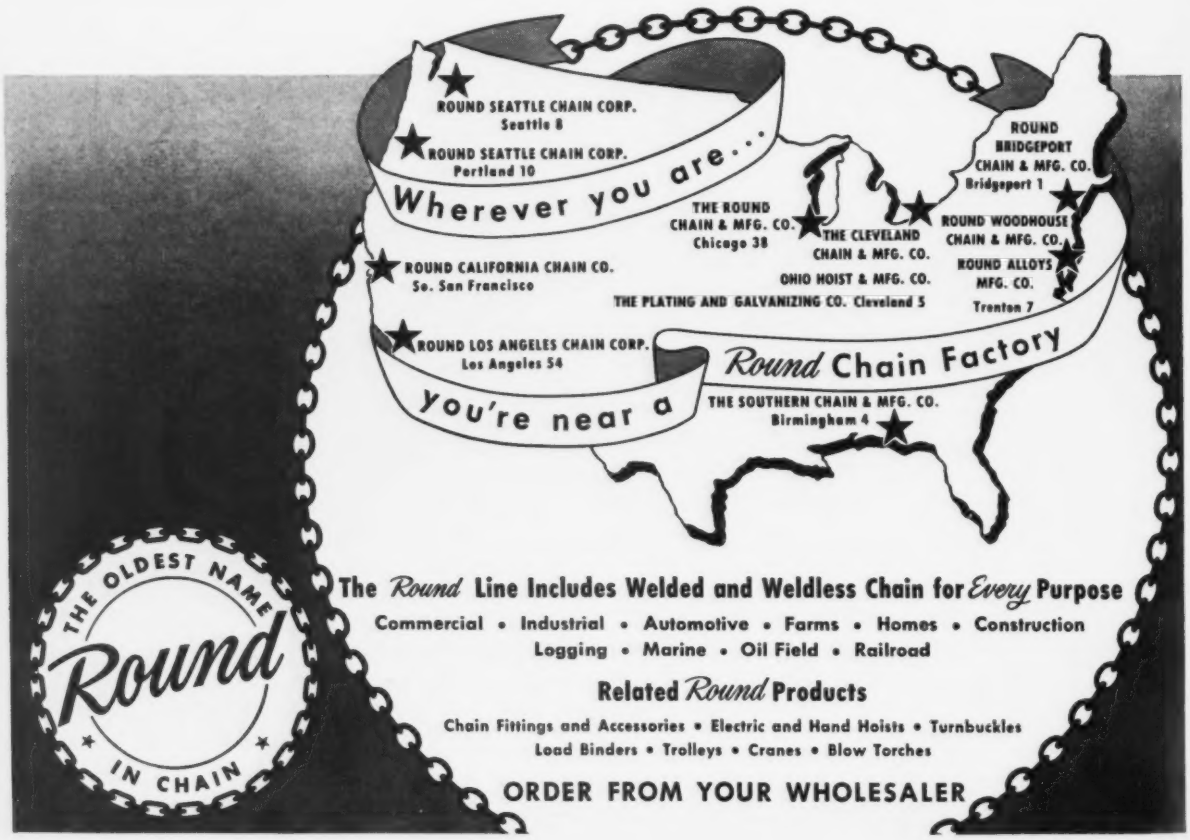
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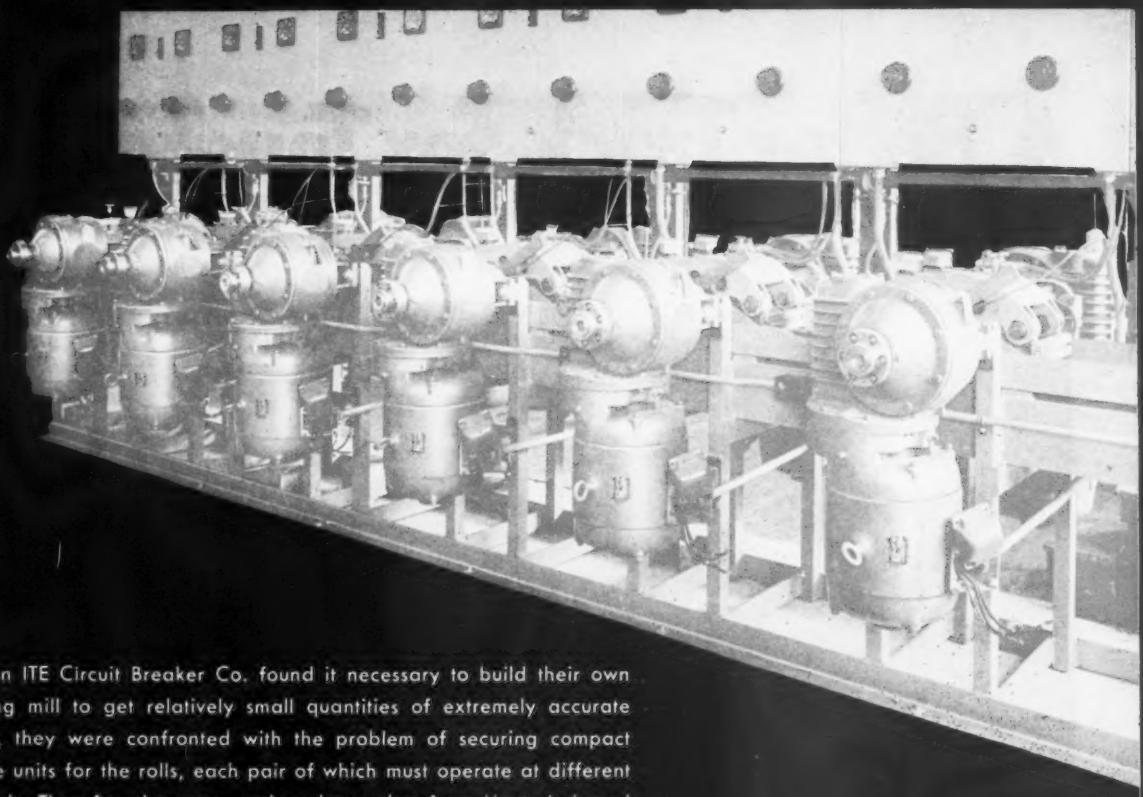


When ITE Circuit Breaker Co. found it necessary to build their own rolling mill to get relatively small quantities of extremely accurate strip, they were confronted with the problem of securing compact drive units for the rolls, each pair of which must operate at different speeds. They found as many others have, that from Master's broad line of Gearmotors they could select standard units which would give them the RIGHT horsepower, the RIGHT shaft speed in one compact unit that they could use RIGHT where they wanted it.

Probably you will never design a rolling mill. But the next time you need motor drives for your plant or product, remember that Master Motors, available in thousands and thousands of types and ratings, give you a selection you can get nowhere else.

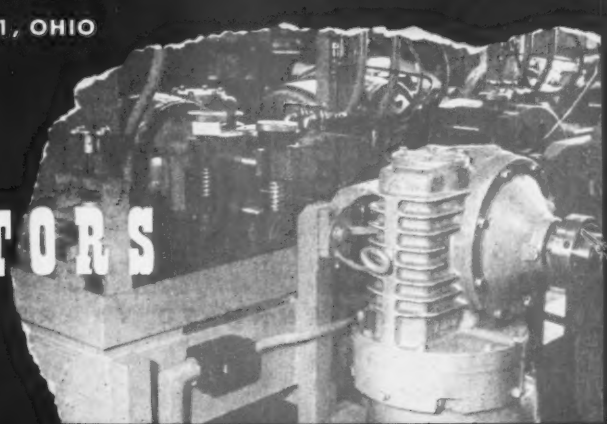
## *tough problem . . . easy solution*

Open, enclosed, splash proof, fan-cooled, explosion proof . . . horizontal or vertical . . . for all phases, voltages and frequencies . . . in single speed, multi-speed and variable speed types . . . with or without flanges or other special features . . . with 5 types of gear reduction up to 432 to 1 ratio . . . with electric brakes . . . with mechanical variable speed units . . . and for every type of mounting . . . Master has them all and so can be completely impartial in helping you select the one best motor drive for YOU.

Select the RIGHT power drive from Master's broad line and you can increase the saleability of your motor driven products . . . improve the economy and productivity of your plant equipment.

**THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO**

MASTER GEARMOTORS



# A Better Truck for Tougher Jobs

**Suggestions for the man looking for a better truck:**

**1.** Talk to someone who owns a White.

**2.** Talk to the man who drives one.

**3.** Talk to any good mechanic who knows the kind of guts White builds into the famous Super Power engines.

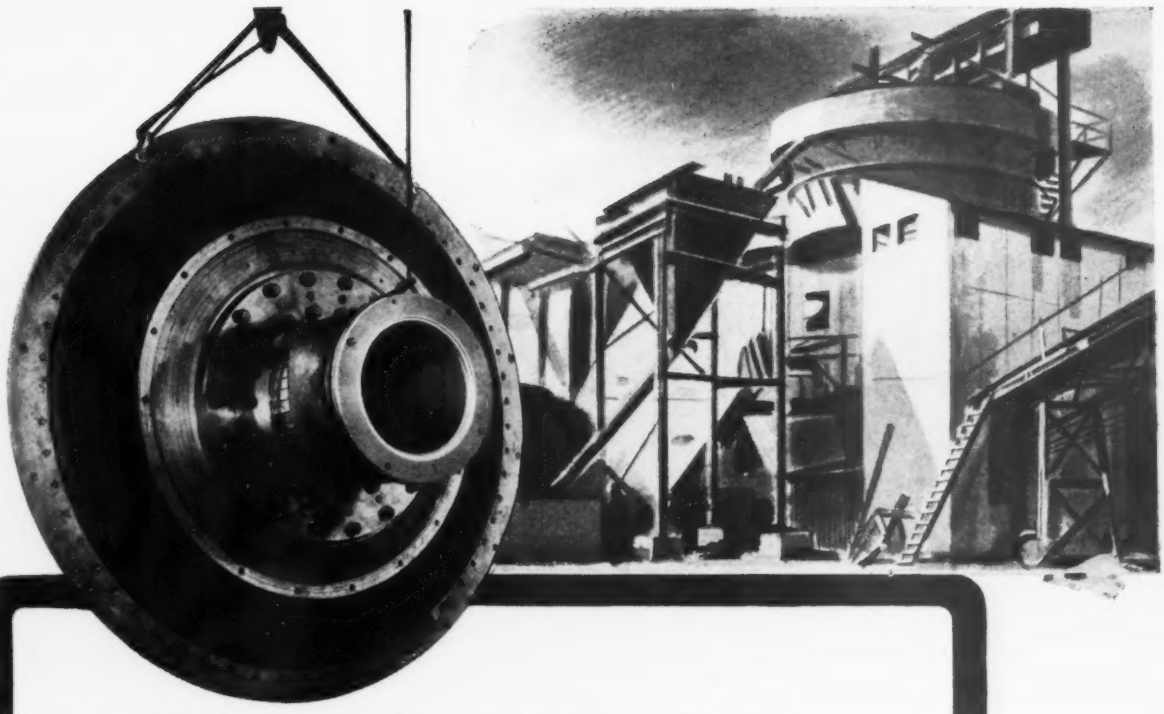
**4.** Ask your local White Representative for his scientific analysis of your particular hauling problem.

***Do these things and you'll be money ahead—because you will know that the finest truck investment you can make today is White!***

White

**THE WHITE MOTOR COMPANY**
CLEVELAND 1, OHIO
*Factory Branches, Distributors and Dealers Everywhere*

**FOR MORE THAN 50 YEARS THE GREATEST NAME IN TRUCKS**



# 15,000 lb. MILL HEAD

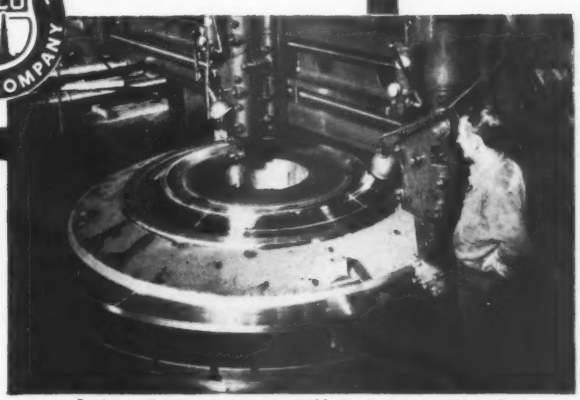
## for cement ball mill
## cast, machined and assembled
## by NATIONAL SUPPLY

Produced for heavy-duty work in a modern cement ball mill, this 15,000 lb. mill head is typical of the integrated manufacturing and precision finishing operations performed daily at National Supply's Industrial Products Division.

The complete facilities of National's conveniently located Torrance plant serve not only the cement but many other types of industry in the western states. Whether the jobs are big and specialized or smaller production runs, National's staff of skilled workers and technicians maintains close control from the melting furnace to the finished product. The result is precision work on a large scale basis.

You'll find it worthwhile to send your tough jobs to Torrance, where the most complete facilities serve the most exacting needs of western industry.

**DON'T MISS**
the exhibit showing other examples of precision work from National's Torrance plant at the Western Metals Show in Los Angeles, March 23 to 27.



Boring mill operation on the 11½ ft. diameter mill head.

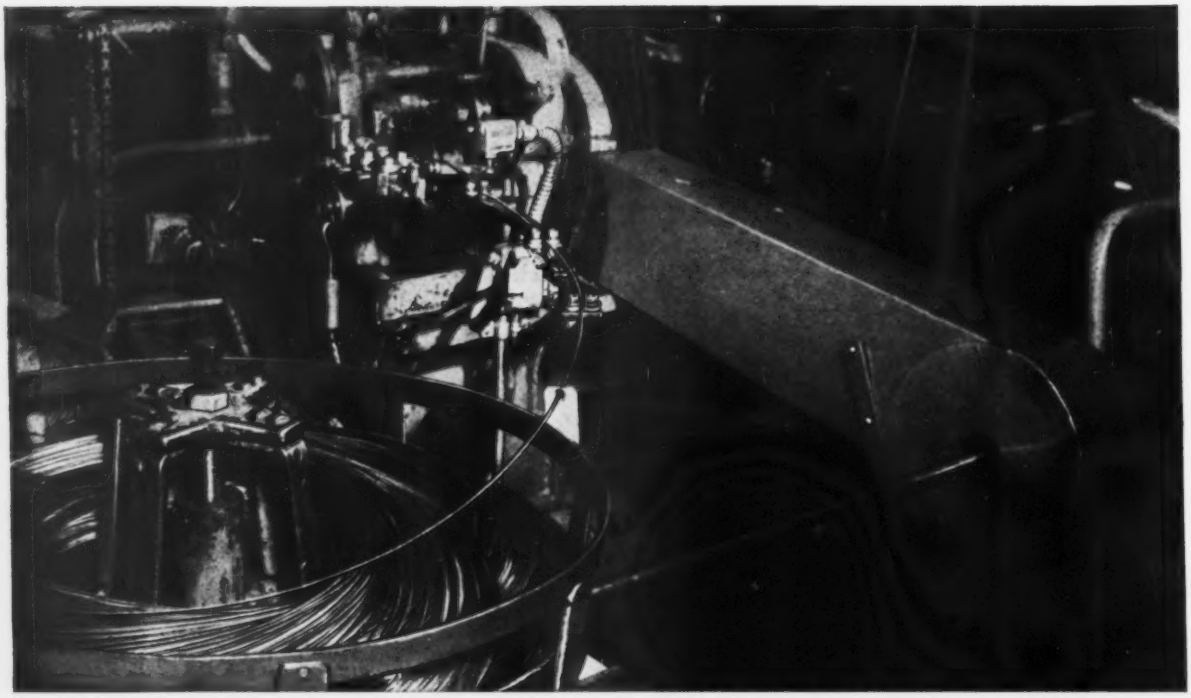
**INDUSTRIAL PRODUCTS DIVISION**

**THE NATIONAL SUPPLY COMPANY**

**TORRANCE, CALIFORNIA • LOS ANGELES AREA**

IDEAL PRESSED STEEL FORGINGS • BILLETS AND LARGE BARS
STEEL CASTINGS AND SPECIAL MACHINERY

MELTING • FORGING • CASTING • MACHINING • HEAT TREATING
ASSEMBLING • WELDING • TESTING



**Forming barrel coil springs,** this machine uses more than ½ mile of Premier Spring Wire for each Beautyrest Mattress. The Simmons Company, San Francisco, has used wire from Columbia-Geneva in every Beautyrest made . . . for over 28 years!

# 1/2 mile of Premier Spring Wire goes into every Beautyrest

**Testing of wire** goes on constantly at Simmons. These 15-gauge barrel coils must carry a load of 2½ lbs. when compressed to 5 inches. U·S·S Manufacturers Wire comes in more than 400 different types, grades, and finishes. And Columbia-Geneva also can produce tailor-made wire to meet your own specifications.

**"Racking" operation** on a Beautyrest Mattress binds cloth-covered coil springs together. These coils are just one of the many uses for U·S·S Manufacturers Wire. Columbia-Geneva, with the greatest wire-making facilities in the West, also produces wire for everything from can keys to coat hangers.

**More than 33 million feet** of Premier Spring Wire is used every year by the Western operation of the Simmons Co. All of this uniform, high-quality wire comes from the mills of Columbia-Geneva, Western producing member of the industrial family that serves the nation, United States Steel.

For any type of wire you need, rely on U·S·S Manufacturers Wire. It's production is rigidly controlled by United States Steel from raw ore to finished product. Columbia-Geneva specialists are always available to help you select the wire that's right for your job. Contact your local distributor or write to Columbia-Geneva Steel, 1403 Russ Building, San Francisco 6.

*Columbia-Geneva produces wire that's tailored to fit your needs*

## U·S·S Manufacturers Wire

*Columbia-Geneva Steel Division, United States Steel Corporation*

San Francisco • Los Angeles • Portland • Seattle • Salt Lake City

**UNITED STATES STEEL**

# "SKIL Tools are one secret of our record production"

## *"More than 130 SKIL Drills Have Helped Keep Smooth Production"*

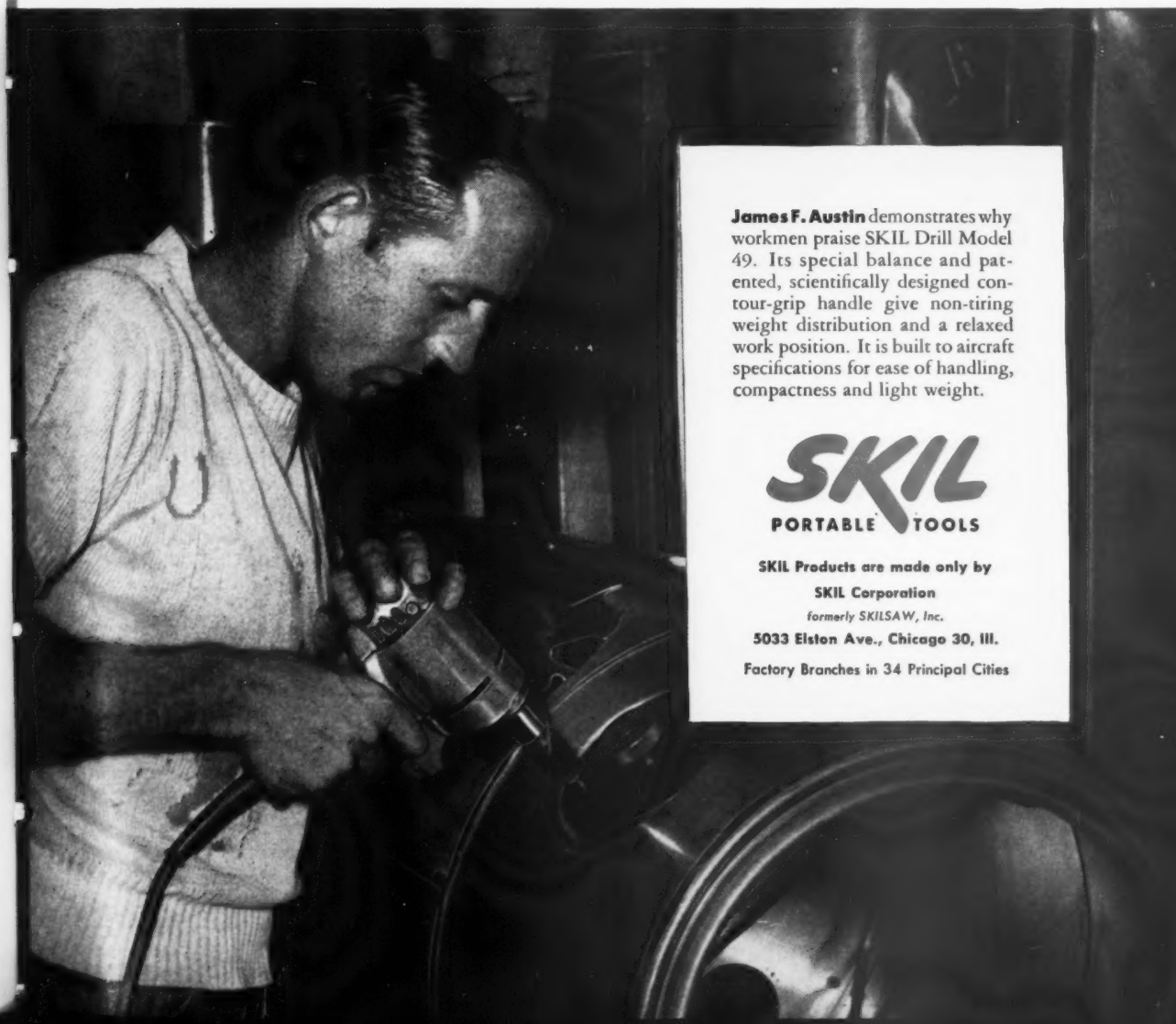
says **Mr. Martin Konoske,**
Production Superintendent
**Fletcher Aviation Corporation,**
Pasadena, California

"The most important single item here at Fletcher Aviation Corporation is meeting production schedules. We make good tanks and we're proud of them, but equally important is the 'on time' delivery stamp at the conclusion of our contracts," says Martin Konoske.

"In meeting these 'on time' deliveries, SKIL tools perform a very necessary function along our production line. We have standardized on SKIL portable drills," added Mr. Konoske. "More than 130 Model 49 SKIL Drills have helped greatly to keep our production lines running smoothly and aided us in producing more external fuel and napalm tanks for the Air Force than any other manufacturer. This pace-setting performance is the result of careful design planning, advanced tooling and a smooth-running production line."

Workman James F. Austin (below) explains this choice. He says, "Power, durability and handling ease . . . that's what sold me on SKIL Drills."

Learn more about what SKIL can do to speed production and cut costs for you. Contact your SKIL Distributor for help in selecting suitable SKIL Tools or phone or write the nearest SKIL Factory Branch.



**James F. Austin** demonstrates why workmen praise SKIL Drill Model 49. Its special balance and patented, scientifically designed contour-grip handle give non-tiring weight distribution and a relaxed work position. It is built to aircraft specifications for ease of handling, compactness and light weight.

SKIL
PORTABLE TOOLS

**SKIL Products are made only by**
**SKIL Corporation**
*formerly SKILSAW, Inc.*
**5033 Elston Ave., Chicago 30, Ill.**
Factory Branches in 34 Principal Cities

# Save Space! Cut Costs!

## with R-W "Zig-Zag"®

## *Continuous Power Conveyor*

### Engineered for Economy and Flexibility

- Horizontal and vertical units alternate in a continuous chain traveling through special steel tubing.
- Complete flexibility for installation in any plant. Easily installed, easily changeable to conform to plant alterations.
- SAFE—all moving parts are fully enclosed.
- Low first costs. Low Power Factor.
- Standard horizontal or vertical curves —two-foot radius.

Richards-Wilcox ZIG-ZAG Continuous Power Conveyors are the last word in materials handling efficiency. Products of many sizes and shapes are carried at various speeds, smoothly and safely. Loss through handling mishaps is reduced to a minimum. And the overhead installation releases valuable space for other uses —increases the efficiency of the plant many times.

ZIG-ZAG—a steel, tube-like track through which travels a specially constructed motor-driven chain—will carry unit loads up to 125 pounds at speeds ranging from 1 inch to 60 feet per minute. It's designed to go up and down, in and around "like water through a pipe." And ZIG-ZAG is flexible, too—if changes or relocation are required you can take it down here and put it up there, and in most cases, *use all the parts!*

* * *

*Learn how patented ZIG-ZAG can save space and cut production costs. Send today for details—or better yet, have an R-W engineer consult with you at no obligation.*

1880 RICHARDS WILCOX R-W AURORA TRADE MARK 1953

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SLIDING DOOR HANGERS & TRACK • FIRE DOORS & FIXTURES • GARAGE DOORS & EQUIPMENT • INDUSTRIAL CONVEYORS & CRANES • SCHOOL WARDROBES & PARTITIONS • ELEVATOR DOOR OPERATING EQUIPMENT

## Richards-Wilcox Mfg. Co.

"A HANGER FOR ANY DOOR THAT SLIDES"

AURORA, ILLINOIS, U.S.A. *Branches in all principal cities*

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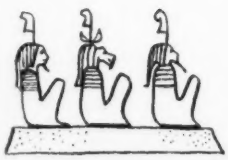
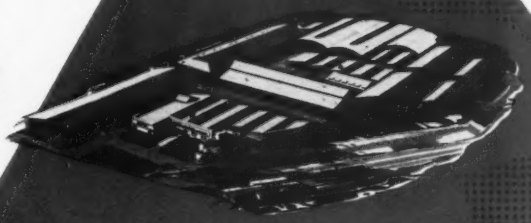
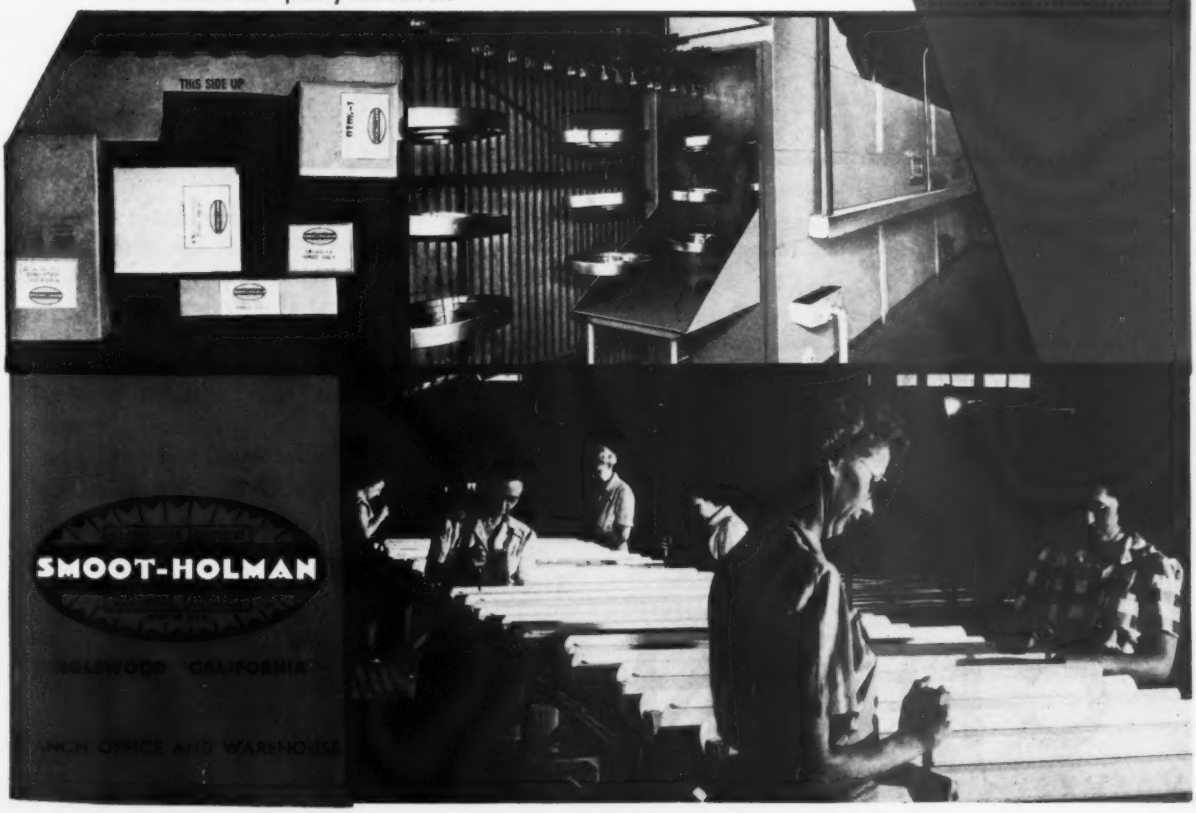


# Time Tested



SMOOT-HOLMAN COMPANY

Through the years SMOOT-HOLMAN has continued its progress in better standards of quality and service, ever mindful of the user's benefit. Your lighting standards may be kept in step with production and merchandising trends through the use of SMOOT-HOLMAN lighting. For service and economy ask your Architect and Engineer to specify and your Electrical Contractor to install our quality luminaires.



# When Honest Work Comes High

Good, honest work like this comes mighty high when it's going into excessive piping repairs and replacements. And how do you control such high costs?

Thrifty buying with a careful eye on the quality of piping materials can help a lot. At today's maintenance rates, better quality was never a sounder investment. The more piping you have, the more you'll see how true this is.

Better quality equipment doesn't cost a penny more. Not when you know the savings it makes in longer life and fewer repairs. There's real economy in valves and fittings that do this. That's why Crane Quality makes Crane equipment the choice of the thrifty buyer.

Crane Co., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill. *Branches and Wholesalers Serving All Industrial Areas.*

# CRANE

**VALVES • FITTINGS • PIPE • PLUMBING • HEATING**

# "We've Found We Can Depend On FRUEHAUFS!..."

**SAYS:** **Mr. R. Middlemiss of National Cylinder Gas Company, Los Angeles, California.**

"**FRUEHAUF TRAILERS** have proved themselves *entirely reliable* on our job. Throughout hundreds of thousands of miles of continuous operation, carrying capacity loads of steel cylinders to our customers, Fruehauf Trailers have delivered exceptional service . . . *at lower costs per mile.*"

*It's a fact.* More and more transportation executives across the country are finding Fruehauf Trailers the best, most economical answer to their hauling needs. And no wonder. Fruehauf, as the world's largest builder of Truck-Trailers, brings business a wealth of on-the-job transportation experience no other manufacturer can equal. And when you buy Fruehauf Trailers, your business profits from nationwide factory service. No matter where your Trailers travel, you'll find complete factory service facilities readily available at Fruehauf Branches strategically located throughout America.

Find out today about the many profit-building advantages Fruehauf Trailers can bring to your business. Contact your Fruehauf representative. Write for the complete catalog.

FRUEHAUF Trailers
"ENGINEERED TRANSPORTATION"

*World's Largest Builder of Truck-Trailers*

**FRUEHAUF TRAILER COMPANY**

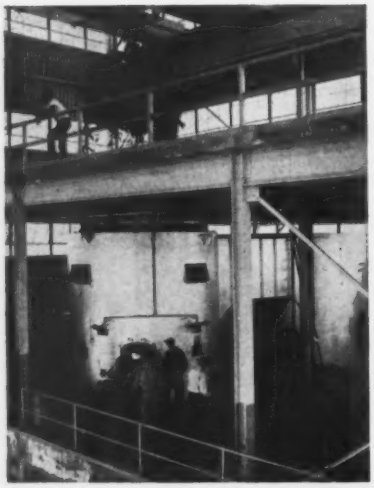
*Western Manufacturing Plants, Los Angeles and Seattle*

*Sales and Service:* **Los Angeles • San Francisco-Oakland • Portland • Seattle San Diego • Fresno • Sacramento • Spokane • Billings • Salt Lake City Boise • Phoenix • Albuquerque • El Paso • Denver**

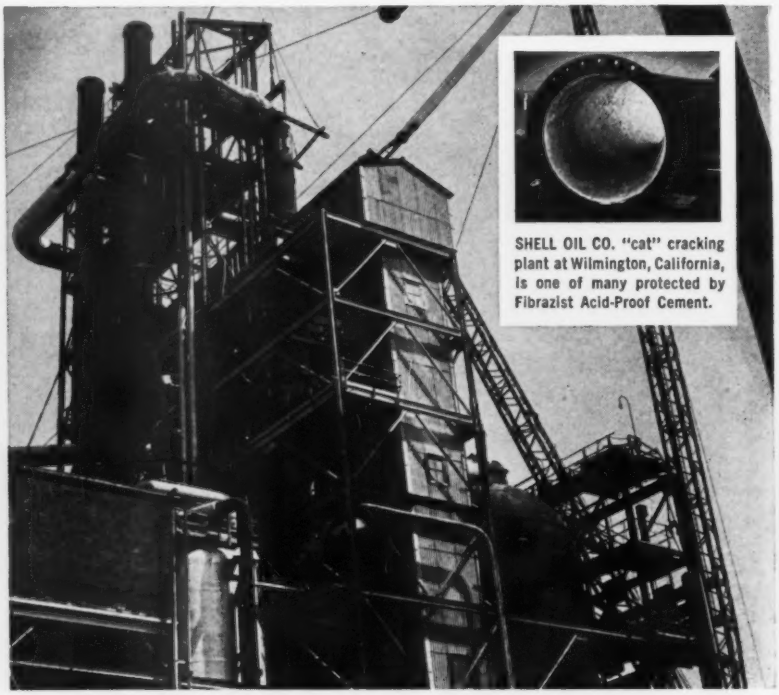
# REFRACTORIES *Reporter*

NEWS-VIEWS FROM THE REFRACTORIES DIVISION OF GLADDING, McBEAN & CO.

## Glendale Completes Municipal Incinerator



Glendale, California's new incinerator is typical of many municipal trash disposal installations designed to reduce smog by carefully controlled burning of combustible rubbish. It is a multiple-chambered furnace with a rotary hearth in the primary combustion chamber. Combustible rubbish is stored in a deep pit adjacent to the furnace and conveyed to the furnace by the clam-shell bucket and crane shown in photograph. Gladding, McBean & Co. clay refractories line the furnace and stack of this incinerator which was designed and built by Nichols Engineering & Research Corp., of New York City.



SHELL OIL CO. "cat" cracking plant at Wilmington, California, is one of many protected by Fibrazist Acid-Proof Cement.

# ACID-PROOF CEMENT LINING GIVES "CAT" NINE LIVES

Fibrazist, fiberized acid-proof cement material manufactured by Gladding, McBean & Co., was convincingly demonstrated recently, when Shell Oil Co. shut down its big Wilmington catalytic cracking plant for a scheduled "turn around."

Eight years ago Shell engineers first employed Fibrazist to combat erosion in the feed lines of the catalytic cracker. Since that time, the application of Fibrazist has expanded. Today there are numerous locations in the catalytic cracker which utilize this material as a protection against erosion.

It has proved less costly and more effective than steel or alloy liners. Maintenance costs have been greatly reduced and troublesome leaks on process liners due to erosion have been eliminated. In addition to offering protection against erosion, this material in certain applications has provided effective protection against corrosion.

Shell and other major oil companies use the material extensively in refinery installations throughout the world.

## Latchford-Marble Rebuilds Furnace Using G-McB. Silica Brick

Last December Latchford-Marble Glass Co. completed extensive repair and rebuilding on one of three continuous glass melting tanks at their Huntington Park, California plant. The furnace, of end-port design, has a rated capacity of 80 tons. Silica brick is used extensively in the construction of breast walls and crown in both melting and refining ends of the furnace. Silica brick, a special refractory product, is manufactured by Gladding, McBean & Co. from high grade quartzite material mined from the company's extensive deposits in Southern California.

GMB

FIRST IN THE FURNACES OF WESTERN INDUSTRY

SALES OFFICES: LOS ANGELES · SAN FRANCISCO · PORTLAND · SEATTLE · TACOMA · SPOKANE

# LOOKING DOWN YOUR PIPELINE . . .

. . . what do you see? Dependability . . . or frequent failure; long, economical life . . . or costly maintenance; W-S FORGED STEEL FITTINGS . . . or the ordinary kind that are a source of constant trouble and expense?

W-S Screw-end and socket-weld fittings are the *only* type that become integral parts of your steel pipe-lines . . . their forged steel construction matches that of the pipe or tubing in chemical and physical properties, in strength, weight and resistance to pressure . . . heat . . . corrosion.

Whatever your pipe or tubing application, you can profit from the permanence of W-S Fittings. Initial cost is often *less;* final cost is always *least.* Literature is available . . . write for it.

## WATSON-STILLMAN FITTINGS DIVISION

## H. K. PORTER COMPANY, INC.

136 ALDENE RD., ROSELLE, NEW JERSEY

Western Industry

# EDITORIALS

## The management press needs a spine

UNDER the heading "What's the matter with company papers?" the weekly letter of the Industrial Relations Council of Utah reports on a study by the New York State Department of Labor of the "labor press" and the "management press."

This study rates the former as the most effective communication with the workers because the management press failed to discuss matters of vital importance to employees. The report is credited with saying further:

"The failure to discuss contract negotiations, grievances, union news, arbitration, wage-hour policy, bonuses, vacations, prices, dividends, equipment costs, taxes and strikes, serves to increase the workers' suspicion that management has no case to present."

Anyone who reads a large number of company papers and magazines every month, as we do, can hardly fail to agree that they leave much to be desired. Some of them are merely a collection of personal news notes from the various company departments, while others have varying amounts and grades of educational information about company products and processes. But there the story ends.

We know many of the editors of these publications as intelligent and progressive people, and—within limits—they do a splendid job. Somewhere back in wartime their status was upgraded from "house organ editors" to "industrial editors," and for some years they have had a national society with branches all over the country.

But the fact remains that they have their hands tied by management when it comes to developing the kind of information described by the New York State Department of Labor. Yes, tied just as tightly as those of the editors of Pravda and Izvestia.

Management could do itself a world of good by giving these editors an opportunity to explore this presently forbidden field. There would be mistakes and blunders here and there, some of them perhaps temporarily disastrous, but probably no more so than the trouble caused by the ill-advised statements (and deals) of some company salesmen. On the other hand, all this would be far outweighed by the satisfaction employees would feel over receiving frank reports from management. There would also be over-zealous, prejudiced and domineering tendencies by management in some cases, but they would defeat their own purpose, particularly if other company publications were reliable and trustworthy.

When will management awake to its opportunity to let its press perform the mission of which it is capable?

## Walls aren't sacred

TO MOVE a machine from one building to another, Boeing recently put it on rollers and tore down the intervening wall, instead of dismantling and reassembling the machine. The saving was $3,000 in money, plus a week's operating time.

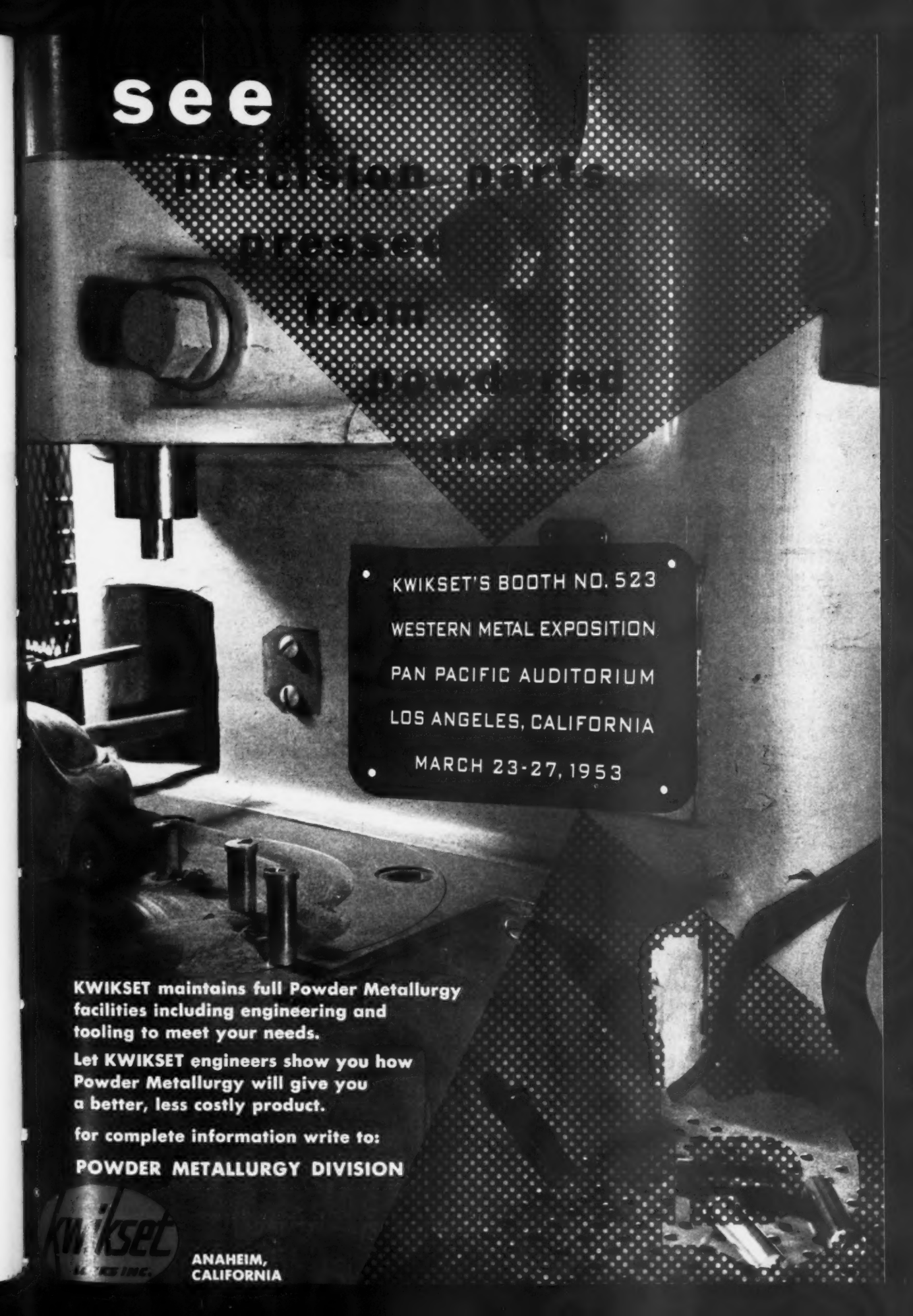
## Indestructible incentive

IS THE INCENTIVE system on its way out? Listen to this: in the book "The Robe" by Lloyd C. Douglas, a landowner in the beginning of the Christian era made the following observation after he had increased a worker's wage from 2 to 3 sesterces a day:

"He even conceded to Marcellus that the sesterces he had added to the workers' wage might have had something to do with the gratifying fact that there had been a surprisingly small loss lately on melons bruised by careless handling."

A sesterce would be equivalent to about 4.1¢ in American money. Even if the pay rate was low, a 50 per cent increase unquestionably must have looked as good then as today.

It could be that the incentive system will last quite a while yet. It seems to have the momentum of nearly 2,000 years behind it.




**KWIKSET maintains full Powder Metallurgy facilities including engineering and tooling to meet your needs.**

**Let KWIKSET engineers show you how Powder Metallurgy will give you a better, less costly product.**

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**POWDER METALLURGY DIVISION**

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**ANAHEIM, CALIFORNIA**

# LETTERS

*Contributions to this column from our readers are welcome. Names will be withheld from publication if so requested. Unsigned letters, however, will be disregarded.*

### Help where it's needed

Editor, *Western Industry:*

I found the January issue very interesting and informative, and it should be of help to us and others in our negotiations with industries interested in locations in this section.

C. D. Lafferty
General Industrial Agent
Southern Pacific Company
San Francisco, California.

* * *

Editor, *Western Industry:*

The seeming simplicity of your capsule coverage of the amazing recent atomic energy developments on the West Coast, which have grown faster and larger than most people realize, in the January issue, is deceptive. But I can guess the volume of correspondence and work that went into rounding up the data. Some of your figures were new to me and I'm making sure that the fellows in Radiation Engineering see the article, which goes into wide circulation today.

We very much appreciate inclusion of SRI in the piece.

William C. Estler
Director, Public Relations
Stanford Research Institute
Stanford, California.

* * *

Editor, *Western Industry:*

I wish to compliment you very highly on your January issue. It is an outstanding job.

Chester K. Sterrett
Manager, Industries Dept.,
Portland Chamber of Commerce
Portland, Oregon.

* * *

Editor, *Western Industry:*

We would appreciate very much your sending a copy of your excellent 1953 annual Review and Forecast of Western Economic Growth to Messrs. A. W. Burchill, Executive Secretary, Washington State Industry Utilization Committee, and Earle D. Williard, District Director, Small Defense Plants Administration (addresses indicated). Both of these gentlemen have expressed interest in the series of informative articles contained therein . . .

C. W. Wilson
Director, Industrial Research
Seattle Chamber of Commerce
Seattle, Washington.

* * *

Editor, *Western Industry:*

I read with interest the January issue of *Western Industry* and want to compliment you upon an exceptionally fine job on what is always a most interesting and valuable publication.

I particularly want to compliment you upon the informative and accurate review of the natural gas situation for the Pacific Northwest. It is always a pleasure to see a subject of this kind reviewed with such objective accuracy.

James F. Bell, Vice Pres.,
Portland Gas & Coke Co.,
Portland, Oregon.

MORE LETTERS ON PAGE 28

FOR HELP ON HYDRAULIC OR . . .

PNEUMATIC POWER PROBLEMS

. . . CONSULT RUCKER

Here you deal with West's largest firm specializing in fluid power systems. We're completely equipped to supply components, design systems to fit your needs, manufacture and install. Power and control systems designed or built by RUCKER are in use on:

EXTRUSION PRESSES • SCRAP PRESSES • PRESSES FOR FOOD, TOBACCO, HAY, TILE • TRIM SAWS • LOG DEBARKERS, TURNERS AND KICKERS • CONVEYORS • CHEMICAL AND PROCESSING EQUIPMENT • METAL SHEARS • STEEL BILLET KICKERS • OIL DRILLING RIGS • CONCRETE PIPE EQUIPMENT • BATCHING PLANTS • DAM GATES • TRUCK HOISTS • SPEED REDUCERS • MATERIALS HANDLING EQUIPMENT • TESTING MACHINES • FARM TOOLS

This RUCKER-designed hydraulic unit powers explosion-proof densifying machine in chemical plant. Driven by 1200 r.p.m., 30 hp. motor, delivers 30 g.p.m. at 1500 p.s.i.

Call us NOW . . . our field men are all experienced mechanical and chemical engineers, qualified to understand your needs. No obligation.

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24

# Finer IN EVERY WAY

**DESIGN**

**CONSTRUCTION**

**PERFORMANCE**

***DIESEL powered for economy***

The new Buda "FT" Series Fork Trucks . . . they're "years ahead" in design, construction and performance —outstanding for their economical operation, quick maintenance, easy maneuvering and load-handling ability. Powered by Buda-built heavy duty Industrial Type Diesel or gasoline engines, proven in millions of hours of operation for dependability and long life.

**See them at your nearby Buda Distributor's today. Write for new Bulletin 1570. The Buda Company, Harvey, Illinois.**

**THE LINE WITH ALL 3 FOR DIVERSIFIED HANDLING**

BH-46

## Western Sales and Service:

Arizona Equipment Sales Co.
Phoenix, Arizona

Buda Engine & Equipment Co., Inc.
Seattle 4, Washington

Buda Engine & Equipment Co., Inc.
Portland, Oregon

Joe Coursey Equipment Co.
Denver Colorado

The Lang Company
Salt Lake City 9, Utah

Roll-Rite Corporation
Oakland 7, California

Motor Power Equipment Co.
Billings, Montana

Air-Mac, Inc.
Los Angeles, Calif.

**BUDA**

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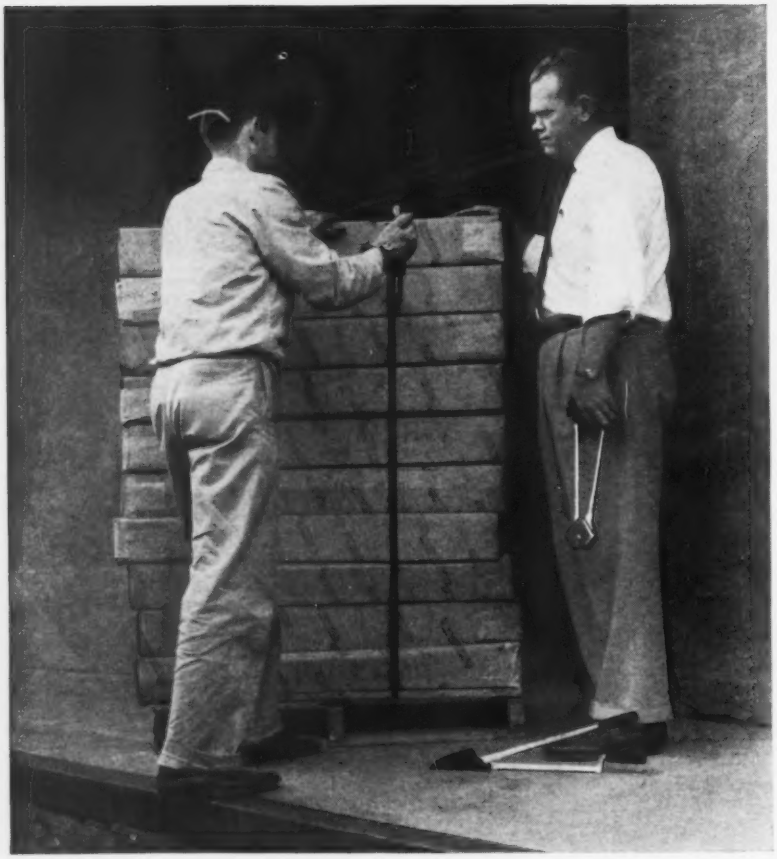


## How Brainard Strapping Service speeds handling of shipments

GLEN BOYD, Brainard salesman in Dallas, is out here on the shipping platform because Brainard service includes *on-the-job demonstration . . .* to make sure steel strapping is properly applied, and its full benefits realized.

In this case, cartons containing knocked-down kitchen tables are loaded by the shipper on a pallet, then the entire unit is steel-strapped. With this method, the shipping unit is rigid, thus protected against damage and pilferage, and can be handled and moved about quickly.

To improve your shipping and materials handling, call your nearby Brainard salesman. He is qualified to study your operations, and recommend and demonstrate the most efficient system for you. Offices located throughout the U. S. In San Francisco: 717 Market Street. In Los Angeles: 1151 South Broadway St.

COMPLETE STEEL STRAPPING SERVICE, LIGHT AND HEAVY DUTY STRAPPING, TOOLS AND ACCESSORIES

Brainard
SHARONSTEEL
STEEL DIVISION
SHARON STEEL CORPORATION

*Write for illustrated catalog. Brainard Steel Division, Sharon Steel Corporation, Dept. Q-3, 717 Market Street, San Francisco.*

**STEEL STRAPPING**

# LETTERS

CONTINUED FROM PAGE 26

Editor, *Western Industry:*

As is your custom, you have produced another fine annual issue of *Western Industry,* made to order for handling certain of the more important industrial plant location inquiries from large eastern companies.

HERBERT F. ORMSBY
Director, Research Dept.,
California State Chamber of Commerce
San Francisco, California.

* * *

Editor, *Western Industry:*

Your January review and forecast is a very valuable publication. It gives the required picture of the industrial development and improvement of the Western states.

It would be very helpful if you could have a summary of the highway and rail transportation improvements needed to aid the present and expected industrial development. Too many congested highways and unequal freight situations are a handicap to the Pacific Coast area.

F. W. MATHIAS, Manager
Olympia Chamber of Commerce
Olympia, Washington.

*(The foregoing seven letters provide a good cross-section of many letters received to date on* Western Industry's *5th Annual Review and Forecast Number.)*

### Disaster defense

Editor, *Western Industry:*

We are desirous of obtaining two copies of *Western Industry* for November 1952, containing the article entitled "Disaster Defense on a Practical Basis."

We would also be interested in receiving forthcoming issues of your magazine.

WALTER C. STEBBINS
Facilities Protection Branch
Federal Civil Defense Administration
Washington, D. C.

*(The above article described the program of Ford Motor Company's Richmond, Calif., assembly plant, and other industrial establishments nearby, combining their efforts to plan what should be done in case of disaster.)*

MORE LETTERS ON PAGE 30

# STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Soluble Oil

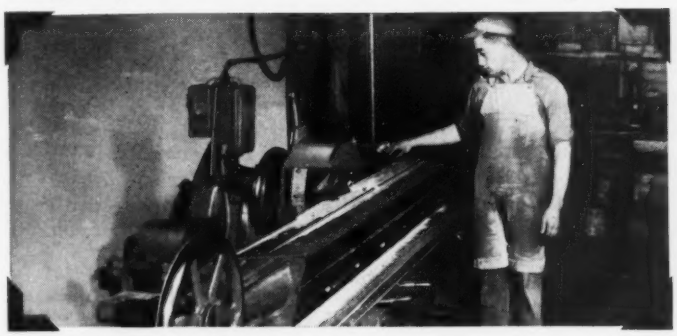
TOOL Precision grinder

LUBRICATOR Circulating flow onto work

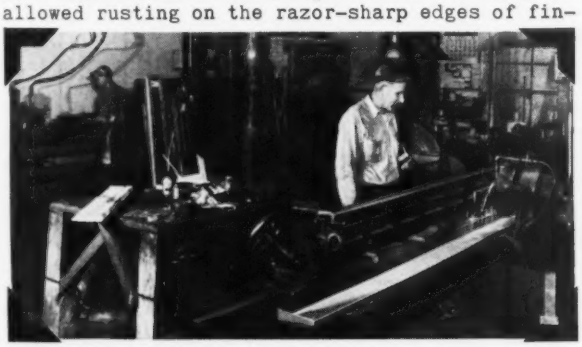
SERVICE Grinding paper-cutting knives

FIRM Sharpe & Company, Los Angeles

## Highly stable oil ends separation and rust problem!



CALOL SOLUBLE OIL was the answer to many problems on this precision grinder, used by Sharpe & Co., Los Angeles, for sharpening paper-cutting knives. Other oils tried turned rancid, separated in storage, and allowed rusting on the razor-sharp edges of finished blades. But when a mixture of only one part Calol Soluble Oil to 63 parts water was used, it remained stable under all conditions, prevented rusting, and held deposits on grinding wheel to a minimum. (Above) Hand-honing blade after grinding.



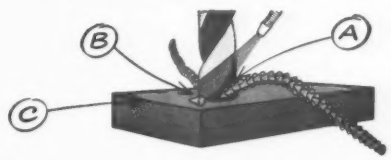
SHARPENING HARD TOOL-STEEL KNIVES for paper-cutting machines all over the West, Sharpe & Co. has used Calol Soluble Oil for more than three years. Owner Eldon Buntin says, "We have had no trouble of any kind since using Calol Soluble Oil. It doesn't separate or permit rusting like other oils we've tried and has never produced a bad odor."

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, is ready for you. Write or ask for your free copy today.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

### How to up efficiency in all metal-cutting operations




Use the correct Calol Cutting Fluid for any operation from grinding to broaching. Recommendations for each are made from actual working results.

A. Have high cooling and lubricating qualities—minimize "built-up edge" and promote good finish.

B. Flush away cuttings readily.

C. Protect machine and work against rusting and corrosion.

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

STANDARD OIL COMPANY OF CALIFORNIA

DOUBLE LOCKING BRAKE

PROTECTS WORKERS ON RACKS, LADDERS, SCAFFOLDS, PLATFORMS

1 SAFE SWIVEL LOCK prevents caster turning

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F900 SERIES CASTER with DOUBLE LOCKING BRAKE available with 5" and 8" wheels

ANOTHER Faultless CASTER

THAT CUTS COSTS FOR INDUSTRY

*Saving man-hours* while *safe-guarding* workers are the dual achievements of this unique locking device. Actuated by a cam, the slot-guided controlled brake shoe simultaneously engages and securely locks the (1) serrated swivel plate and the (2) caster wheel. Reversal of the foot lever retracts the shoe from both braking surfaces—the brake cannot drag. Quick, easy, positive action in either position. The spring action of the hardened lever compensates for wear and insures full braking action throughout long service life.

Two full rows of hardened ball bearings roll around precision formed and hardened raceways—requires less man-power for moving cumbersome equipment. Write for further details on this *safe* caster, today.

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Pacific coast office and warehouse: 1252 So. Boyle Ave., Los Angeles 23, California.

Stocks carried for immediate delivery


# LETTERS

CONTINUED FROM PAGE 28

### "The Learning Curve"

Editor, *Western Industry:*

We are interested in getting the complete series of "The Learning Curve" by Glen E. Ghormley of the University of Southern California, which has been published in your magagine.

JAMES W. DICKEY
Executive Vice President
Round Chain Companies
Cleveland, Ohio.

* * *

Editor, *Western Industry:*

We have found the magazine very useful. The recent articles on Learning Curves interested us very much.

PHILIP TRIPOLI
Producibility Design Engr.
Northrop Aircraft, Inc.
Hawthorne, Calif.

*(If sufficient demand is indicated,* Western Industry *will reprint in booklet form the entire series of articles on "The Learning Curve".)*

### The light, sans bushel

Editor, *Western Industry:*

This magazine contains valuable information. It brings to light latest developments throughout industry. Many ideas can originate through its well written articles.

FRANK TORSAK
Assistant General Foreman
North American Aviation, Inc.
Inglewood, Calif.

* * *

Editor, *Western Industry:*

My cordial compliments on the extremely helpful book you put out each month.

GEORGE V. CHRISTIE
Vice President
First National Bank of Arizona
Phoenix, Arizona.

* * *

Editor, *Western Industry:*

Your magazine is quite informative, and a pleasure to browse through.

W. J. RADLER
Supt., 2d Division
Masonite Corporation
Ukiah, Calif.

**watch these AIRCO processes** PROVE

*See the Aircomatic® gun in action*

**themselves at the....**

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**LOS ANGELES,**

**MARCH 23 TO 27**

**BOOTH NO. 346**

Seeing is believing! Be sure to visit the Airco booth at the Western Metal Congress. You'll see actual demonstrations of the latest Airco-developed processes, and we'll answer all your questions on these and other Airco contributions to effective economical metal fabrication.

**Aircomatic® welding** — both manual and automatic — will show you how this high speed inert-gas-shielded metal-arc process can save you time and expense and give you an improved product! Produces top-quality welds in "hard-to-weld" metals and alloys without flux . . . minimum plate-edge preparation . . . little or no preheat.

**Precision gas cutting** will look easy when you actually see it . . . and it is! The Airco Monograph cutting machine cuts any shape you want within a 56" x 32" area! Straight cuts . . . circles . . . irregular shapes. Pen in place of cutting torch demonstrates the accuracy and versatility of this portable "electric-eye" tracing device.

***You'll also have the opportunity to investigate these other Airco developments:***

**Heliwelding** (you'll see an actual demonstration).
**Automatic hardfacing** with the NEW automatic Heliweld head.
**NEW machine tool cooling process with liquid $CO_2$.**

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*A Division of Air Reduction Company, Incorporated*

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OPERATIONS

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■ With Snap-on's Master set you're equipped for an exceptionally wide range of nut turning operations. The four Snap-on handles . . . Ratchet, Speeder, Spinner, Sliding Bar . . . with three extensions and universal joint, provide the utmost in wrench flexibility, speed, power . . . save time on straight-away jobs . . . quickly reach and turn difficult and "hidden" nuts. Supplied with full range of socket sizes, 7/16" to 1¼".

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*Snap-on is the trademark of Snap-on Tools Corporation


# CALENDAR OF MEETINGS

MARCH 23-24—*Canners League of California* 49th Annual Directors Conference at Santa Barbara Biltmore Hotel, Santa Barbara. Contact M. A. Clevenger, 64 Pine St., San Francisco. GA 1-3791.

MARCH 23-25—*Intermountain Logging Conference* at Davenport Hotel, Spokane, Wash. Contact Charles Keim, Kalispell, Wash.

MARCH 23-27—*Western Metals Congress and Show,* Pan-Pacific Auditorium, Los Angeles. Contact W. H. Eisenman, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

MARCH 25-26—*West Coast Lumbermen's Association,* annual meeting, Multnomah Hotel, Portland. Contact association office, 1410 S.W. Morrison St., Portland.

MARCH 26—*Portland Cement Assn.,* regional safety conference, at Davenport Hotel, Spokane, Wash.

APRIL 7-8—*Northwest Wood Products Clinic,* Spokane, Wash. Contact R. O. Batdorf, W. 521 Fourth St., Spokane.

APRIL 8-10—*The Society of the Plastics Industry, Inc.,* SPI Pacific Coast Section Conference, Last Frontier Hotel, Las Vegas, Nev.

APRIL 9-10—*Western Cotton Shippers Assn.,* regional convention in San Francisco. Contact Mr. T. J. Harvey, Executive Vice President and Secretary, 108 E. Fourth St., Los Angeles.

APRIL 9-12—*Oil Heat Institute,* Pacific Coast convention, Davenport Hotel, Spokane. Exposition in 161st Infantry Armory. Contact Robt. G. Elmslie, 305 Lloyd Bldg., Seattle.

APRIL 13—*National Association of Suggestion Systems,* first annual regional West Coast conference. Statler Hotel, Los Angeles. Contact J. H. Bortle, AiResearch Mfg. Co., 9851 Sepulveda Blvd., Los Angeles 45.

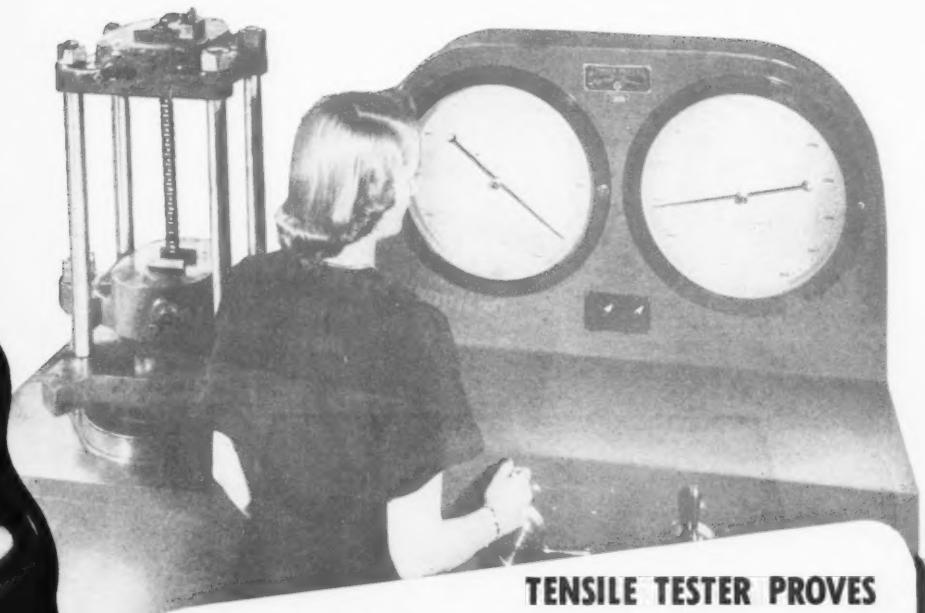
APRIL 16-17—*Pacific Northwest Industrial Waste Conference,* fifth annual, at State College of Washington Campus, Pullman. Contact E. B. Parker, Director of Industrial Services, State College of Washington, Pullman.

APRIL 19-24 — *National Industrial Health Conference,* at Statler Hotel, Los Angeles. Contact Dr. Jerome Shilling, Rm. 911, 740 So. Olive, Los Angeles.

APRIL 21-22—*Pacific Coast Management Conference,* at the Claremont Hotel, Berkeley, Calif. Contact California Personnel Management Assn., 2180 Milvia St., Berkeley 4, for additional information.

CONTINUED ON PAGE 34

# PRE-TESTED SUPER-STRENGTH FOR *Trouble-Free* PRODUCTION



## TENSILE TESTER PROVES THE EXTRA LIFE IN ATLAS ROLLER CHAIN

Tortured and torn, in tests more rugged than any you would give it in normal use, Atlas Roller Chain gives daily proof on this Tensile Testing Machine of its super-strength. You know, before you buy it, that Atlas Chain has all the strength you'll ever need . . . to stand up and take it . . . year in and year out . . . under every operating condition.

The Tensile Tester is your guarantee that every Atlas Chain drive will deliver full rated horsepower. Result . . . your machine can run at full rated speeds, with consistently greater production and lower maintenance.

For maximum load-carrying ability and longer trouble-free life, install the chain with pre-tested strength.

**Write today for the new Atlas Catalog and Handbook on roller chain. Atlas "Super-Life" Roller Chain is available through leading distributors everywhere.**

**ATLAS CHAIN & MANUFACTURING CO.**

**PHILADELPHIA 24, PA.**

ATLAS

# ATLAS ROLLER CHAIN

SIMPLIFIED OPERATION
...Designed by MOTO-TRUC
A Twist of the Wrist . . .
Moves Your Load
Roller
Grip
Control
Patented control affords simplicity of operation unequalled in the lift truck field.
Lifting or lowering control buttons affords quick, easy accessibility.

Practically *anyone* can learn to operate a MOTO-TRUC! Anyone in your plant can become an operator with very limited instruction . . . This is made possible by MOTO-TRUC'S "Roller Grip" control.

Speeds are controlled by a "twist" of roller grip . . . Extreme up or down position of the handle sets the brake . . . A push button on either side of the roller grip controls up or down Hydraulic lift . . . it's as easy as that . . .

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PALLET . . . PLATFORM . . . HI-LIFT TRUCKS

*LARGEST EXCLUSIVE MANUFACTURER OF "WALKIES"*

MOTO-TRUC Designers FOR THE INDUSTRY PATENTED

# CALENDAR OF MEETINGS

CONTINUED FROM PAGE 32

APRIL 23-24—*American Association of Petroleum Geologists*, Rocky Mountain Section, Casper, Wyoming, annual regional meeting. Contact H. E. Summerford, chairman of exhibits, Box 279, Casper.

APRIL 24—*American Water Works Assn., California Section*, spring regional conference, Deep Well Ranch Hotel, Palm Springs.

APRIL 27-30—*Boiler Code Committee of American Society of Mechanical Engineers* and *National Board of Boiler & Pressure Vessel Inspectors*, joint meeting, Multnomah Hotel, Portland.

APRIL 29-MAY 1—*Electronics Components Symposium*, at the Shakespeare Club, Pasadena, Calif. Contact Dr. A. M. Zarem, Chairman of Executive Committee, Suite 1011, 621 S. Hope St., Los Angeles 17.

MAY 4-7—*Northwest Electric Light and Power*, regional meeting at Davenport Hotel, Spokane, Wash. Contact Carl A. Hoffman, Spokane. MA 5115.

MAY 17-19—*Pacific Northwest Trade Association*, meeting at Hotel Winthrop, Tacoma, Wash.

MAY 18 (tentative date)—*ASME Boiler Code Committee* and *National Board of Pressure Inspectors*, a joint meeting, Portland, Ore.

JUNE 28-JULY 1—*Rocky Mountain Coal Mining Institute*, Hotel Colorado, Glenwood Springs, Colo.

AUG. 2-9—*Western Conference on Apprenticeship*, Balboa Park, San Diego. Contact Joseph H. Stephenson, Supervisor, Trade and Technical Trades, San Diego Vocational School, San Diego.

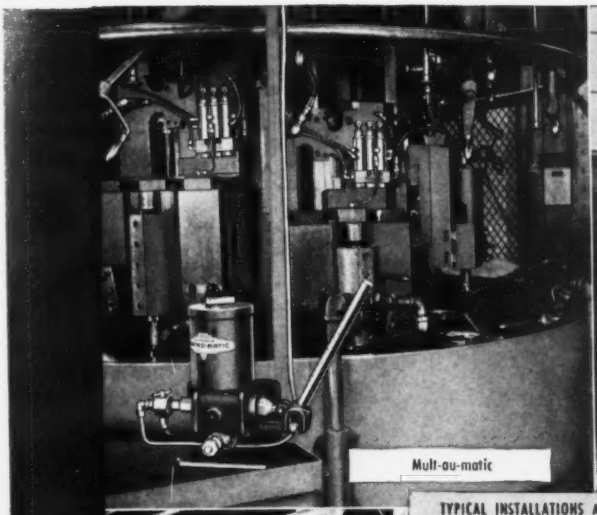
AUG. 17-22—*Institute of Radio Engineers Manufacturers Assn.* and *West Coast Electronics*, regional conference and exhibit in San Francisco. Contact Mr. Heckert Parker, exhibit manager, 1980 Jefferson St., San Francisco.

AUG. 19-21—*Western Electronic Show & Convention* at Civic Auditorium, San Francisco. Contact Frank Haylock, 58 W. Popular St., San Mateo, Calif.

SEPT. 13-16—*American Institute of Chemical Engineers*, national convention in San Francisco. Contact George Gester, P. O. Box 1627, Richmond, Calif.

OCT. 20-22—*Pacific Coast Management Conference*, at the Claremont Hotel, Berkeley, Calif. For further information contact California Personnel Management Assn., 2180 Milvia St., Berkeley 4.

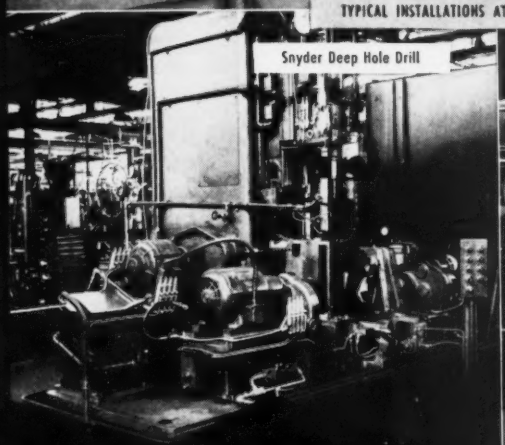
DEC. 1-2—*Northwest Mining Assn.*, regional meeting in Spokane, Wash. Contact E. C. Stephens, Peyton Bldg., Spokane 4.



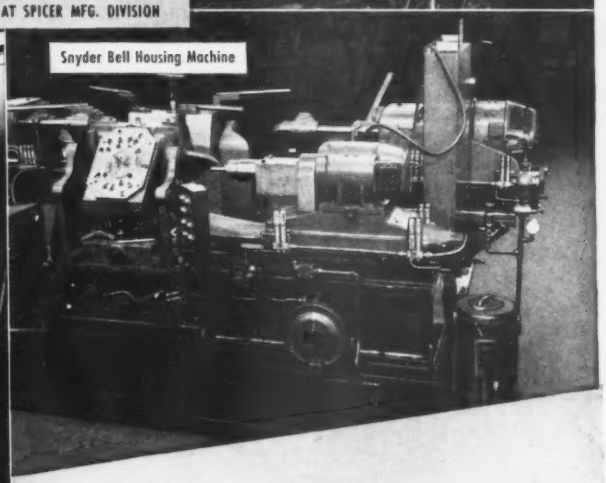
Mult-au-matic

Flex-Tooth Chip Crusher

TYPICAL INSTALLATIONS AT SPICER MFG. DIVISION



Snyder Deep Hole Drill



Snyder Bell Housing Machine

# "Replacing Hand Lubrication with LINCOLN Centralized Lubrication Systems Saves Us Approximately $100,000 Annually"

R. C. Lohbauer
Production Engineering Staff
Spicer Mfg., Division of Dana Corp.
Toledo, Ohio

'There is more to lubrication than Webster's definition, 'to make slippery'. We define lubrication as 'applying lubricants to bearings in such a manner as to maintain a constant film of oil between moving surfaces'.

"Four years ago, a study of our lubrication practices and costs led us to a program of *standardizing* our lubrication methods by installing Lincoln Centralized Lubrication Systems on 86 vital machines. Here are some of the amazing figures in cost reduction resulting from our program:

## Bullard Mult-au-matic Lathes

Maintenance cost reduced 60% or $72,000 annually
Production increased 20%
Produces better quality of work
Reduction in amount of scrap
Direct labor saving of $25,000 annually.

## Atmospheric Controlled Gas Carburize Furnace

Direct maintenance labor savings, $1,200 per year
Savings in bearing material, $600 per year
Eliminated one hour per day lubricating allowances, $580 per year
Output increased 13% due to decrease in down-time

## Chip Crusher

Direct labor saving of $1,280 annually
Saving in replacement parts, $500 annually
Elimination of full time maintenance man, $4,667.52 annually.

"These are typical of savings effected throughout the plant. Lubrication boils down to maintaining a constant film of oil between moving surfaces by applying the *right lubricant* at the *right time* and in the *right quantity*, by the proper method."

*R. C. Lohbauer, Production Engineering Staff*
*Spicer Mfg., Division of Dana Corp.*
*Toledo, Ohio*

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LUBRICATING EQUIPMENT • • •

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HIGH QUALITY HIGH CARBON WIRES

*People want and expect more things than ever before in history—and by special delivery, too.*

And that, to a considerable extent, is true of the wire business. The day when any wire would do has long since passed—and that is one of the reasons why JOHNSON MUSIC WIRE is made in more than 200 sizes, all the way from 8.3 feet to over seven miles to the pound. And every order is routed for the fastest possible special delivery.

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# THIS MONTH'S COVER

## A GAMBLE ON THE WEST that paid off

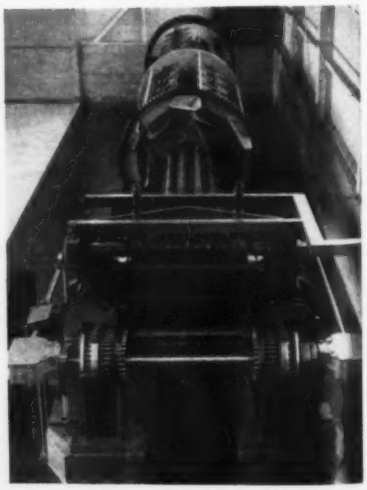
BACK IN 1916, a young fellow named E. H. Edwards gambled everything he owned on his belief in the future of the West. There was no wire rope plant of any kind in the West, and Eastern firms didn't think it was good business to establish one.

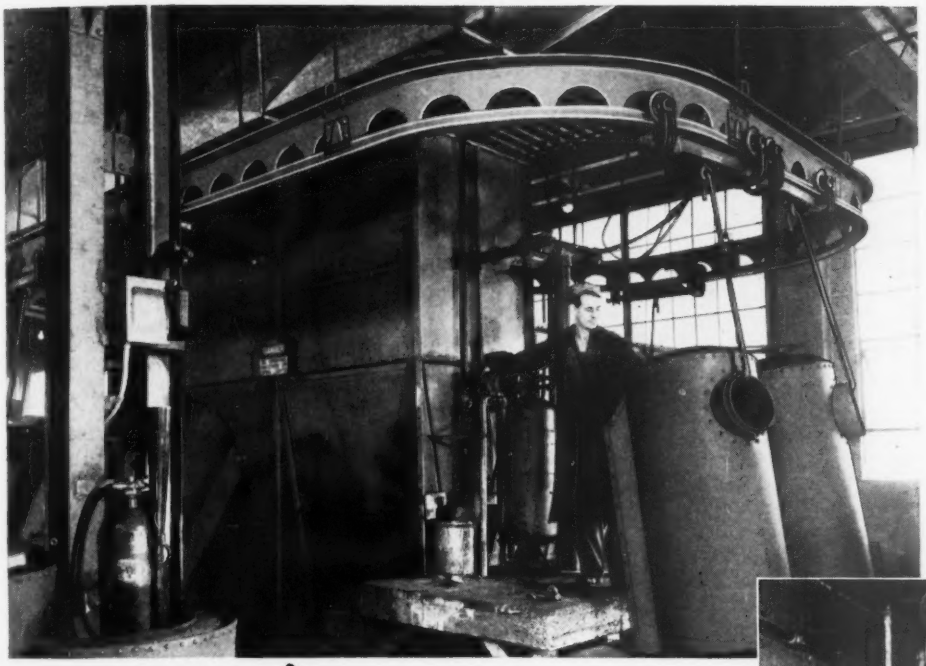
But Edwards was firm in his belief that lumbering, oil and construction were done differently in the West—and that a Western wire rope manufacturer who designed and built specifically for Western conditions could compete successfully with the large established Eastern producers.

E. H. Edwards' early spirit and confidence in the industrial growth of the West have been more than justified. E. H. Edwards Co., with plant at South San Francisco, has hewn out for itself a sizable place in a highly competitive field. And it has done this by concentrating its distribution and service in the West.

Expansion plans are ready now for 1953 and 1954.

**"WELDWEAVE" machine which manufactures stucco netting is one of many unique mechanisms to be found in the E. H. Edwards plant. Designed and built by the company, it is the only one of its type in operation today. As wire is fed from a variable number of spools attached to rear bobbin of machine, it is placed in criss-cross pattern with wires from front bobbin and spot welded at each point where two wires cross. This amounts to 50 simultaneous welds.**





One man transfers furnace bodies, weighing 200 lbs., coming from welding booths to Tramrail track by means of a lift platform. Usually when he advances one carrier to spray booth, all 16 carriers must be moved at same time.

The curved track section is necessary to bring the furnace bodies near the water screen during spray painting so that paint in atmosphere will be removed properly. All points of a body are easily reached when supported overhead and the work is extremely fast.

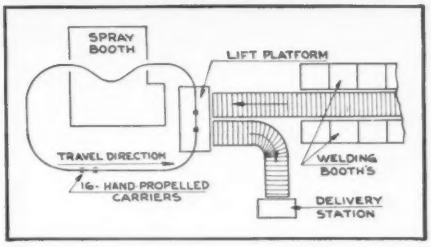
# *Easy Push* Moves 16 Carriers on Spray Booth Loop

CAN one man push 16 loaded four-wheel carriers (with 64 wheels in all) around an enclosed Tramrail track loop having six left-hand and two right-hand curves?

That question bothered the Armstrong Furnace Co., Columbus, Ohio, one of the world's largest furnace manufacturers, when they were developing their paint-spray systems for painting furnace bodies. There was considerable fear that friction and binding of so many carriers would create too great a load for one man to push hundreds of times during a normal working day.

They now have two such systems in operation. One man easily moves the carriers even when all are loaded. Little effort is required because of ball-bearing wheels and hard smooth flat treads on both wheels and track and easy swiveling yokes.

The systems are extremely efficient, requiring only two men each. 300 furnace bodies can be painted with each, in an eight-hour period.



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BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

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THE CLEVELAND CRANE & ENGINEERING CO.
8862 EAST 284TH STREET • WICKLIFFE, OHIO

**CLEVELAND TRAMRAIL**
**OVERHEAD MATERIALS HANDLING EQUIPMENT**

# Sure of your Alloys?

## Call Ryerson and Be Sure* 8 Ways!

Like the bar in this picture, *every bar* of Ryerson alloy steel has its mark—a symbol that identifies the particular heat from which the bar was rolled. And on all but the smallest bars this heat symbol is unmistakably stamped into the steel itself.

The result: Positive heat identification, just one of eight ways that we protect you against the many slips that could occur before the alloy steel you order reaches you.

Your protection begins with careful selection of the heats to be carried in our stock. Next, analysis is verified and all Ryerson alloys are spark tested to guard against mixed steels. Then the bars are color marked and stamped to identify type and heat. Meanwhile, we test a sample of every heat for hardenability and interpret the test results for you. So, finally, when you call Ryerson for alloys, you can be SURE—sure of the steel you get and sure of what it will do.

Tested steel—racked separately by heats—is taken from stock; prepared to your specification; given a final inspection and shipped to you quickly. And with your steel (as-rolled or annealed), you receive complete test data to verify quality and guide your heat treatment.

This 8-point quality control is yours, at no extra cost, from Ryerson—and only from Ryerson. Just call your nearby Ryerson plant.

***See them demonstrated at the Western Metal Show in Los Angeles, March 23-27, Booth 251.**

# RYERSON STEEL

RYERSON CERTIFIED STEELS

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SAN FRANCISCO PLANT: Box 188, Emeryville. Plant: 65th & Hollis Sts. Phones: OLympic 3-2933, ENterprise 10176.
SEATTLE STEEL PLANT: Box 3268, Seattle 14, Wash. Plant: 1200 - 4th Ave., South. Phone: Seneca 2300.
SPOKANE (INLAND EMPIRE STEEL) PLANT: Box 2158, Spokane 10, Wash. Plant: North 207 Freya St., Spokane, Wash. Phone: Keystone 9311.

Western Industry

MARCH 1953

# AUTOMATION

## *Not just a luxury for monster factories, but a simple, practical means of saving labor and money in small plant operating*

AUTOMATION in the sense of *control* of industrial operations may well be regarded by historians as the distinguishing characteristic of the second industrial revolution.

In the first place, the machine replaced man's muscles. In the second, automation will replace his brain as an industrial control device.

It is truthfully said of such controls that they can see better, hear better, measure better than humans—they are more reliable, more powerful, more precise, think and move faster than human operators; they never get tired, they work around the clock, don't make mistakes, don't talk back, are obedient and fully predictable. They have few personal problems and they won't go on strike.

By

**FRANK SHALLENBERGER**

Associate Professor of Business Management
Graduate School of Business
Stanford University

### What electronic controls can do

Electronic controls can and are already being used for the direction of many industrial processes. The primary limitations to their use are technical and economic. At present there are few standard components available for attachment to existing equipment; each installation requires individual and costly engineering, and most industrial engineers are simply not technically qualified to use these new electronic devices.

At the same time, there are many, many shops where electronic controls are neither necessary nor practicable. In most situations pneumatic cylinders, cams, solenoids, thermo-couples, limit switches, can do the job more reliably and at much lower cost.

But the future potential of electronic controls is tremendous. The ability of these devices to think, choose, remember, to accept and use information fed in on a tape or punched card, to solve elaborate equations and to apply the solution to the control of complex industrial processes, makes electronics the real key to the fully-automatic factory of the future. This is the automation that goes beyond mechanization.

Without getting involved in the sociological effects of automation, it is important to point out that in it we

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Western Industry

MARCH 1953

# AUTOMATION

## *Not just a luxury for monster factories, but a simple, practical means of saving labor and money in small plant operating*

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But the future potential of electronic controls is tremendous. The ability of these devices to think, choose, remember, to accept and use information fed in on a tape or punched card, to solve elaborate equations and to apply the solution to the control of complex industrial processes, makes electronics the real key to the fully-automatic factory of the future. This is the automation that goes beyond mechanization.

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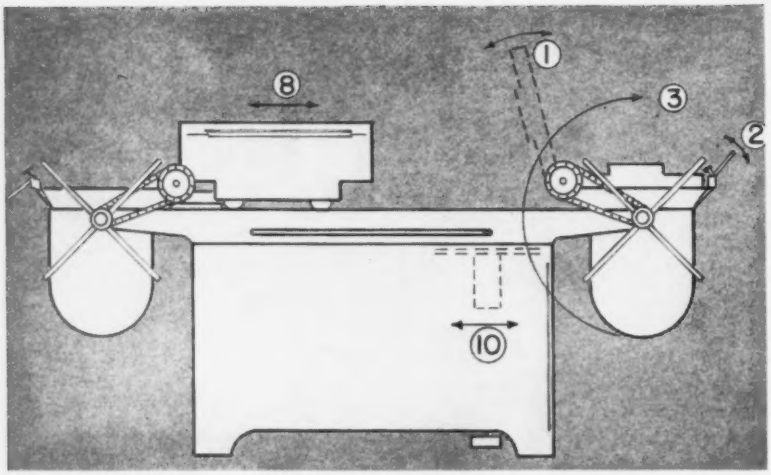



**Example of automation opportunities applied to equipment for use in small foundries. Diagrammatic view of the Shalco shell molding machine, showing steps where automation can be put into use. Figures refer to the accompanying text. (1) Closing the box. (2) Clamping. (3) Inversion. (8) Moving the oven. (10) Moving stripper.**

**Photographic side view of same machine with box and capstan in foreground; oven is seen at the right. This is a hand-operated prototype, to be further mechanized.**

may find the key to the most serious human problems of mechanization—the monotonous routine, repetitious job. These jobs, the curse of modern, mechanized industry, are those most readily automatized. Automation seems destined to replace large numbers of unskilled and semi-skilled workers with a relatively few highly trained technicians whose function it will be to keep these fabulous and expensive machines operating.

Out of this general discussion arises the question, where does the small plant fit in? Won't the need for large capital investment, for highly skilled technicians, for elaborate sales and production planning tend to concentrate industry in the hands of the large concerns and force the small company out of competition?

### Two examples described

We may shed some light on the subject by describing two machines and their automation for small plant use. The first of these is still in the development stage, has been constructed thus far only as a manually-operated prototype. But we are presently looking forward to its automation and perhaps we can think out the problems of its automation together today. The machine is a shell molding machine, specifically designed for small-plant use.

Essentially, the shell molding process consists of dumping a mixture of sand and thermosetting resin onto a heated metal pattern. Heat from the pattern penetrates into the mixture and cures the plastic close to the pattern.

After the desired "build-up" has been obtained, the pattern is inverted and the uncured mix falls off, leaving a thin shell of half-cured mix clinging to the pattern. The pattern and shell are then put into an oven, where the shell is cured. After curing, the shell is stripped from the pattern. Two shells placed together form the mold into which the metal is poured to form the casting.

### Ideas for the future

For the future, our thinking runs somewhat like this: The machine could be made 100% automatic. Many of those in the East approach this. But, there is little object in automatizing unless there is something to be gained in labor-saving, quality, productivity, safety or similar benefit.

Only complete automation would eliminate the labor. There is little point in having the worker stand around and watch the machine work. But partial automation might enable him to run two machines or assemble shells, cement, clamp, or perform similar work.

Automation would help reduce the skill requirements, but actually there is very little required even on the manually-operated machine. The effort involved is minor. Automation should reduce the variability in process and product, by standardizing the investment and cure time.

But this is a new process and more investigation will be necessary to determine the importance of these times. Automation might increase productivity somewhat by forcing adherence to ideal cycle times, and would "pace" the operator.

Which of these steps should be automatize?

1. *Close box.* This is a simple hinge action. Originally this movement required considerable effort, especially with a heavy pattern plate. We have reduced the effort to practically nothing by using a 2:1 ratio in the sprockets and by adjustable counter-balancing springs. In an automatic model, we would probably use an air cylinder to open and close the box. Air is already at the machine for stripping and spraying. This might permit elimination of the clamps, for the air cylinder would hold the pattern closed to the box.

2. *Clamping.* If clamps are necessary, they will be air clamps, actuated by a valve which opens when the dump box starts its inversion. These may be added even on the hand model so that the operator turns the capstan continuously. Alternatively, a Geneva movement could close the clamps mechanically.

3. *Inversion.* The boxes are presently inverted by means of a capstan. We are inclined to favor an air cylinder for actuating the rotation on the automatic model. Within limits, the speed of rotation does not appear to be critical. In hand operation, the operator gets a "feel" for the right speed, and we have translated this into air piston speed by taking motion pictures of the hand operations.

4. *Investment.* The dwell during the build-up of plastic and sand influences the thickness of shell. The ideal here is a balance between shell strength and materials cost. Once the correct time is determined, the control is not difficult. An inversion timer, like an hour glass, would be appropriate in the case of a hand-operated machine and an electric timer in the case of the automatic machine.

5. *Reversion.* This would be accomplished in the same manner as the inversion.

6. *Unclamping.* Same as clamping.

7. *Opening.* Same as closing.

Automation of the steps involved in closing and inversion of the dump box, just described, would afford the operator adequate time to attend another machine or to clamp or cement shells.

8. *Move oven.* This is a reciprocating motion, simple to automatize. But, there is little to be gained in doing so. There is little benefit from a quality standpoint, for the timing is not critical and could be about as well controlled by an indicating bell or light. There is no safety involved and very little effort.

Finally, this operation immediately precedes the stripping operation, which we have determined should be manually handled in any case. Therefore, the operator will be at the machine when the oven move takes place. An air piston or gear motor and sprockets and interlocks would add over 10% to the sale price of the machine, an increase we at least tentatively consider unwarranted.

9. *Stripping.* As in most machines, the most difficult phase to automatize is the loading and unloading. Here the *loading* is merely replenishing the mix in the dump box which is simple and occurs only every dozen cycles or so. A hopper above each box would be appropriate in a production operation.

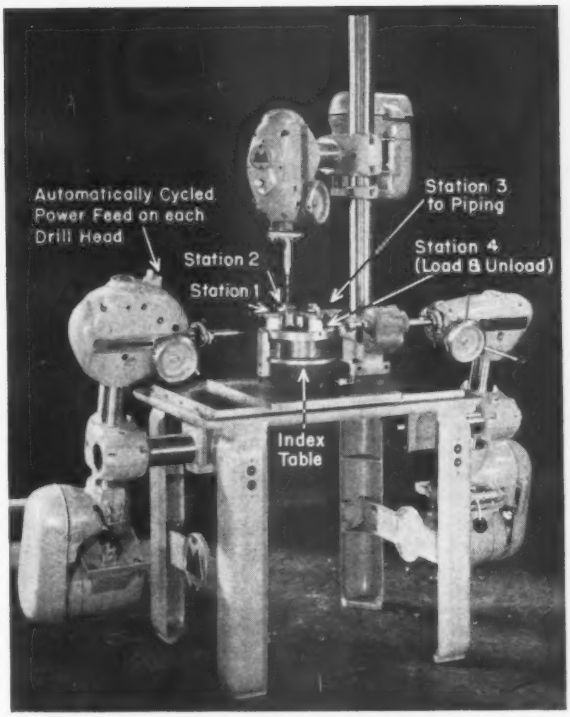
The *unloading* is the stripping and removal of the shell. Automation here would involve fingers to lift and remove the shell, carry it aside and dispose of it. This is the most critical operation, the place where things are most likely to go wrong, where inspection is necessary to assure quality and detect errors in previous steps. For these reasons we have no intention of automatizing it.

### The Magna drill

Another machine which, while not designed specifically for small plants, is ideally adapted to such use and to automation is the Magna Drill, recently developed by Magna Engineering Company and made in Berkeley.

This probably represents the first really new thinking on drilling. It is predicated upon the assumption that since little can be done to speed up the drilling cycle, itself, the greatest opportunities lie in shortening the load and unload elements and in drilling more than one hole at a time.

The outcome of this thinking is a highly flexible, highly productive drilling machine with very important implications for the small shop. Basically, it is a machine mounting as many drill heads as desired, in a way that they can be quickly arranged for simultaneous multiple drilling in any plane.




**Automatizing applied to the Magna drill, whose principle is to shorten the load and unload elements and to drill several holes at one time.**

Thus, it can perform operations similar to the elaborate Ex-Cell-O, Kingsbury or other multiple-drilling machines without the high initial cost and with complete flexibility for change-over. It brings to the job shop much of the efficiency of the long run, continuous production tooling of specialized plants. Characteristics can best be illustrated by describing several jobs as set up on this machine.

On the first of these, as originally set up, the job took 2½ min. per piece; now it takes ½ min. There are five set-ups, including four jigs; now there is one set-up, and $185 worth of tooling plus a $265 index table. In the first station, the set-screw hole is drilled; in the second the axial hole is drilled, and in the third station the set-screw hole is tapped. Loading and unloading, the fourth station, is so rapid that the operator has time to assemble this part to three mating parts—in other words, production time has been cut to 1/5 and the assembly operation is thrown in "for free."

### Production tripled

In the second case, three holes are drilled. Previously, production was 40 units per hr., using a tumble jig for the two holes and another jig for the tap. Now production is 120 units per hr., and the tooling cost only $125. Moreover, the operation is much easier for the operator has only to pick up the part, not the jig.

Four holes are drilled, in the third case, and two tapped at the rate of 1,100 per day.

All these operations and two or three others are performed on the same machine in runs of four 5,000 units. Change-overs take only two, four hours. The typical small plant may not be able to pick and choose its jobs so readily. You will note that all these jobs are somewhat similar, but usually the work comes to the shop which has the tools.

### Significance for small plants

To illustrate the extent to which such a machine can be automatized, a five-head unit has been set up in a little shop in this area to do a series of second operations on an ordnance part. This is completely automatic, with the exception of loading and subsequent deburring. The production rate is 1,200 per hr.

What can we learn from these examples? What significance do they hold for the small plant?

Undoubtedly their most important significance is that someone is doing something for the small plant, that there are equipment manufacturers who are thinking and designing and planning for the small plants' specific problems. In this conection, here are two other examples:

General Electric has developed an automatic lathe equipped with what they call "playback control." As the machinist makes the first piece, his

operations are recorded on a magnetic tape.

Then, in the same manner as a tape recorder plays back the voice, this device "plays back" the operation, automatically repeating the operation on that lathe or any number of other lathes so equipped. It also repeats all hesitations, mistakes, and trial cuts made by the machinist, but presumably these can be edited out by cutting and splicing.

### Still another

This machine sounds wonderful, but listen to this one! The Arma Corporation has developed an automatic lathe directed by a punched paper tape similar to a player piano roll. The lathe reportedly was set up in 15 minutes, and turned out in four minutes a piece which took a skilled machinist 30 minutes, with blueprints, to produce.

In other words, it was set up and turned out the first piece in about ⅔ the time required by the conventional lathe to turn out one piece and thereafter turned them out about eight times as fast as the conventional lathe! And the small plant would not have to mortgage the shop to get such a control unit. It was coupled to a standard engine lathe at an estimated cost of only $1,500.

### And accurate

What is even more startling is the accuracy of such control. Utilizing the principle of "feed back," a sort of built-in supervision, the unit monitor assures itself that it has done exactly what the tape told it to do. On this operation tolerances held to .0003!

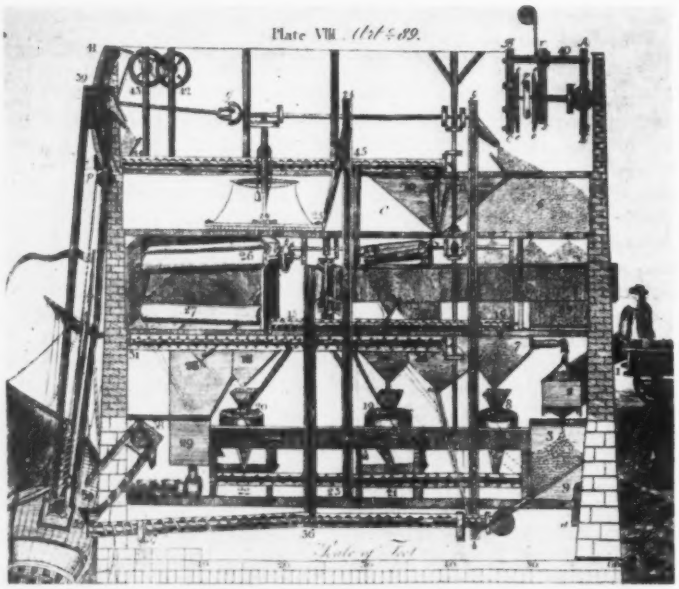
Neither of these lathes is yet available, but their significance for the small shop is readily apparent.

All these examples demonstrate that some considerable degree of automation is practicable in small plants, that the payoff is there if it is gone about logically and realistically, that automation does not necessarily require a large capital investment and long-run continuous production, and does not necessarily inhibit flexibility.

The experience in automatizing the shell molding machine and the thousands of industry-wide applications of pneumatic cylinders, solenoids, limit switches and so forth indicate that standard, off-the-shelf components are available and adaptable to automatizing production operations. There will be more available as the demand grows. Electronics are not necessary in most situations. In fact, electronics are only a part of the automation picture, useful primarily where programming, complex control or full automation is involved.

One man in the organization should have responsibility for the automation program. He should become thoroughly familiar with the many and varied actuating and control devices available, should learn simple circuits, not electronic circuits but the use of limit switches, relays, and so on. There are few outsiders to whom the small plant can turn for advice in this field, but a new profession may develop over the next few years—the automation engineer. This opportunity should be seriously considered.

One of the big hurdles is the union problem. The primary savings from automation are labor savings, and every plant manager clearly recognizes labor as one of the most expensive, most variable, most unpredictable factors with which he has to work. In many plants the union is able to block assigning a man to more than one machine, so partial automation would have little to offer other than giving the man more idle time. Companies have been forced to mount several machines on a single base to meet this problem. Fortunately all unions do not offer such opposition.




**Rube Goldberg missed this one by 150 years. It is the first complete production line, achieved before American industry really existed, a mechanized flour mill developed by Oliver Evans in Philadelphia, 1783.**

## Mechanization not so modern . . .

### . . . *antedated our Constitution*

EVANS devised the first system where mechanical conveyance from one operation to another eliminated the labor of human hands, introducing the endless belt and different types of conveyors, regulated to one another. A screw conveyor first brought the grain into the mill, a bucket elevator raised it to the top story, handling 300 bushels an hour. From this elevator, the grain fell on an inclined belt—a prototype of today's belt conveyor—thence down to the millstones and from the millstones back to the top story. Illustration and text taken from "Mechanization Takes Command," a book by Siegfried Giedion.

**AUTOMATION for large plants has been given wide publicity, but here, apparently for the first time, is a discussion of its application to small plants. It was given by Prof. Shallenberger six weeks ago at the Industrial Engineering Institute at the University of California. This article is adapted from his paper presented on that occasion.**

The Navajo Tribal Sawmill turns out 18,000,000 board feet of lumber annually; has done so well that two more mills are planned.

# NAVAJO INDIANS STEP INTO INDUSTRIAL FIELDS

## *Transformation includes tribal sawmill that built up $1,000,000 surplus in four years. Mining operations in prospect*

AFTER SITTING BACK for three generations while the rest of the West went ahead from grubby pioneering to industrial prosperity, the Navajo Indians have turned to the American way of doing things. Now a new economic subdivision is shaping up in the high, semi-barren wastelands of northern Arizona and New Mexico.

A new work-and-develop program has already raised the annual per capita income of 75,000 Navajos from around $100 to approximately $300. This is better than it sounds, when you consider that they pay no direct taxes and live in rent-free "hogans" on tribal lands.

### Government joins in

Not only is Navajo individual buying power making itself felt in surrounding cities, but a government assist in the form of a long-range rehabilitation program, now in its second year, is throwing from $8,000,000 to $10,000,000 a year into roads, schools, hospitals, housing, irrigation and industrial development on the 16,000,000-acre reservation.

This means a continuing market for at least eight more years for machinery, equipment and supplies of all kinds needed for the upgrading of a backward area the size of West Virginia. What is happening in Navajo Land is what happened in New England; in other words, to compensate for barren soil, other resources are being developed.

The Navajos' outlook took a turn for the better in the mid-1930's when the tribe reached the end of its rope as a pastoral society depending on livestock for a living. Population had outstripped the supporting capacity of the land. Sheep and cattle were growing poor on over-grazed ranges. Depression-ridden tourists were buying fewer Navajo rugs and silver-and-turquoise trinkets.

As a result, thousands of Navajo men and women were forced to abandon their long-cherished tribal aloofness and go off the reservation to work for wages. They made good as section hands on the railroad, harvest hands on commercial vegetable projects, construction workers, factory workers, miners.

Once the tribal blanket was off, "The People," as the Navajos call themselves, began to Americanize fast. They went in for automobiles and trucks and modern household improvements. Their leaders assumed increasing responsibility as the government relaxed its controls. In many ways they did a better job than the Indian Bureau had been doing.

### Consider the sawmill

A case in point is the tribal sawmill. This had been run by the Bureau for 16 years as a sort of employment enterprise and never had shown a profit. The Tribal Council took over its management in 1947, put in an experienced sawmill operator from the outside, and piled up a million-dollar cash surplus in four years.

Of all the 20 new enterprises the

Scouring wool at the Navajo Tribal wool processing plant at Leupp, Arizona. This plant produces specialty yarns and fabrics, and provides Navajo weavers with a graded, uniformly scoured product.

Finishing goat pelt rugs at the Navajo tribal tannery at Leupp, Arizona, on the reservation. These snow-white, fluffy small rugs are very popular in the Southwest.

Indian Supt. Allan G. Harper (left) and Sam Akeah, who is president of the Tribal Council. Harper sits in on council sessions, gives a quick okeh to most proposals.

Council has taken under its wing since that time, the sawmill remains the bellwether, the demonstration de luxe of what the Indians can do on their own.

Here is how it operates. Biting into an excellent stand of virgin timber, the mill turns out around 18,000,000 board feet of first-class lumber annually, sells it in the open market, which reaches as far away as Chicago. It employs 225 Navajos and six or seven white workers in peak seasons. In this and all other tribal enterprises, the manager is required to train a Navajo understudy for his job. In addition, it is a training field throughout, allowing Navajos to work as irregularly as they wish, and training others for the jobs in a sort of rotation system.

### Rates are O. K.

Several years ago competing lumber operators in the Southwest protested that the Navajos were underselling them because of low wages, low stumpage charges, no taxes, etc. As it turned out, the Navajos were not price-cutting any more than the others and were paying wages well above the minimum level established by the federal government.

Reservation timber is so good and there is so much of it that the Tribal Council has recently authorized the building of two additional sawmills. These will be equipped with the same type of modern machinery that has made a name for Navajo lumber.

Profits from the sawmill, plus revenues from oil, gas and uranium mining leases on Navajo lands and a license fee from white trading post operators bring the tribal treasury about $2,000,000 a year. A cash balance of around $5,000,000 is maintained, but it is dipped into vigorously whenever money can be put to good use in developing essential facilities or sponsoring new enterprises.

### Uranium project

Uranium mining has expanded rapidly since it was discovered that a large part of the reservation lies within the fabulous Colorado plateau to which the Atomic Energy Commission looks for a continuing source of fissionable stuff for bombs and isotopes. The tribe has drawn $600,000 in bonuses from more than 450 uranium mining properties.

Most of the mining has been done by Vanadium Corporation of America and one or two other companies, employing Navajo labor. Recently the tribe decided to go into the mining business on its own account, and is looking for locations. A scientific mineral survey is being conducted by geologists from Arizona and New Mexico state colleges to see what else could be mined to advantage.

### Crafts promoted

Some of the other tribal enterprises that are zooming along are the Arts and Crafts Guild which promotes the production and sale of a million dollars worth of Navajo crafts annually, a wood products plant that manufactures furniture, a wool textile industry that produces specialty yarns and fabrics, a cement block plant, a tanning and leather products industry, a coal mine, a project for producing flagstone, kaolin, fullers' earth, etc., two motels, three mercantile centers, a ram-breeding enterprise, a wagon-buying enterprise, a project for purchasing several large ranches in surrounding areas to relieve population pressure and take excess livestock off the reservation.

For all these enterprises the Tribal Council believes in buying good equipment and hiring expert help from outside for management, wherever necessary. The tribe pays a general business manager $12,500 a year for supervising all of the enterprises. A vocational program is preparing Navajos for 42 skilled and semi-skilled jobs.

The tribe has a revolving loan fund to help individual Navajos go into business for themselves. Navajos operate nine coal mines, 29 trading posts, several ore-handling services and other profitable businesses.

### N-a-v-a-j-o spells progress

The picture is becoming clear that the Navajos are not by nature backward. They developed a calendar hundreds of years ago that most businessmen would like to use today. It divided the year into 13 months of approximately four weeks each. Their religion would fill a book larger than the English Bible. Their difficult, but complete, language often compresses a full expression into one word. They know and use hundreds of plants and herbs for medicinal and other purposes. They identify in Navajo terms 200 parts of an automobile. They invented the only known type of upright loom for weaving their unique rugs, and their silver-and-turquoise jewelry is a standard item in the novelty field.

Navajos were among the first of livestock groups in the Southwest to try out the services of commercial rain-makers. They are air-minded, and are developing a Civil Air Patrol squadron with 25 young Navajos enrolled. The Council plans to build air strips throughout the reservation to attract movie makers from Hollywood, who have abandoned production in some very colorful locations because of bad roads.

As workmen, Navajos are long on patience and detail. That is why officers in charge of the Wingate Ordnance Depot near Gallup, New Mexico, say they wouldn't have any other kind of help. The depot has won citation after citation for accuracy and safety control.

A Gallup banker is working on a plan to bring textile plants from the West Coast to take advantage of Navajo skills in fabric and garment manufacture. Numerous dress shops in the Southwest are getting into the national market with casual dresses based on native Indian costumes.

Western suppliers will find plenty of activities going on in Navajo Land of interest to their sales departments. Item for future consideration: the Navajo tribe has an agreement with the El Paso Natural Gas Company, in return for the New Mexico-California pipeline right-of-way, that they will be able to tap the line for 5,000,000 cu. ft. of natural gas per day whenever they get ready to use it.

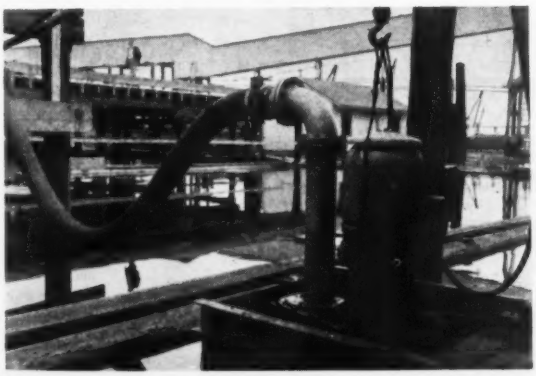
By the time natural gas and electricity are distributed on the reservation—and it may not be as long as you think—a brand new $50,000,000 annual market for the good things of life will have materialized in that land of color and drouth where "Lo-the-poor-Navajo" was supposed to be vanishing, but who, instead, multiplied fivefold in 50 years, while the U. S. as a whole merely doubled in population.

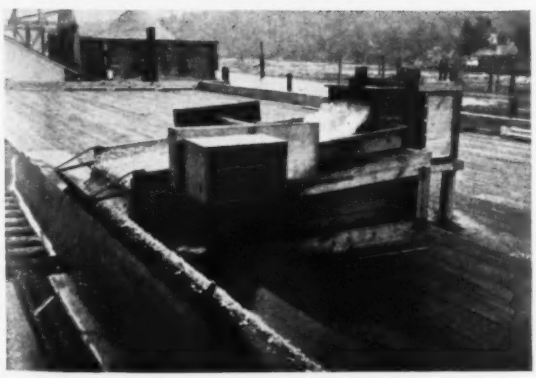
**Navajo weaver near Bluff, Utah. Occupation is languishing because other kinds of work pay more. Note that pattern is not woven from side to side. Lower part will be rolled up when top is woven.**

## POLLUTION PROBLEM SOLVED

### *Sawdust pump at plywood mill aids fishing in Puget Sound*

A PUMP that removes sawdust from the mill pond so that pollution hazards are minimized has been installed by St. Paul & Tacoma Lumber Co. at their plywood mill. The pump is a 6-in. type NC Pacific vertical non-clog with a capacity of 1,200 gpm. against a 40-ft. head, operated by a 20-hp. motor. Large quantities of sawdust, resulting from cutting logs into proper lengths, used to remove oxygen as it decayed, and formed sludge on the bottom of Puget Sound. This was a decided hazard to fish. The new installation is considered a model in pollution control, and has been better than 95% effective.





**TOP—Here is the pump on the back end of the dragsaw float, which provides the suction to pull the sawdust through the trough from the other side. It is then expelled with the water from the outlet into the flexible hose that carries it to the shaker screen on the mill deck.**

**BOTTOM—This is the shaker screen, located on the plywood mill deck, where the water and sawdust from the dragsaw is discharged. Most of the water is shaken off the sawdust which travels on rubber conveyor belt in the foreground until it reaches the fuel pile for the boilers.**

# OLD MAN OBSOLESCENCE BEATEN TO THE PUNCH

*By continually developing by-products, Portland Gas & Coke protects its future, come what may*

### Look forward, not backward

**LOT'S WIFE became a pillar of salt because she failed to look ahead. Buggy whip manufacturers may have survived the horseless carriage age, but not by confining themselves to buggy whips.**

**"There will always be street cars" was the financial advice often given to widows who were being encouraged to buy street railway company bonds. And a commentator passing his judgment on Social Security observed that "the greatest security is insecurity."**

HOW CAN WE meet new, keen competition, continue to use our present plant, and show a profit? These are questions every alert executive asks constantly.

One unusual answer, or set of answers, has been found by the Portland Gas and Coke Company, a public utility which for many years manufactured only gas for residential and industrial uses in the Portland area.

The petroleum industry of nearby California has always been a competitor of gas fuel, since low freight rates on ocean barge or tanker movements have given the Pacific Northwest area petroleum fuels at relatively low prices.

Later, more competition appeared when dams were installed and tremendous power from rivers was converted to electricity. The low cost of hydroelectric power resulting from federal subsidy made this energy competitor of gas for certain residential uses a real threat.

Portland Gas & Coke has used two devices which other industrialists have employed successfully before, to meet competition. It has developed means of utilizing lower grade, less expensive raw materials for gas manufacture, thus reducing operating costs, and has capitalized on its waste products, or by-products.

Utilization of the second device is a highly interesting story. The by-products business by November 1952 increased to $4,888,000 gross annual sales, which represents 37% of the company's total gross sales. This splendid record was not achieved by chance, and many answers came the hard way.

#### Facilities and products developed

The present Gasco plant was put into service in 1912 for the production of gas from California fuel oils. Since that time its gas making and appurtenant facilities have been enlarged and developed, not only for the production of gas but also for the processing of residuals into commercial by-products, into what is generally recognized to be one of the most efficient oil gas plants in the U. S.

Briquetting of the carbon residual into an ash-free domestic solid fuel was the first important by-product developed from oil-gas production.

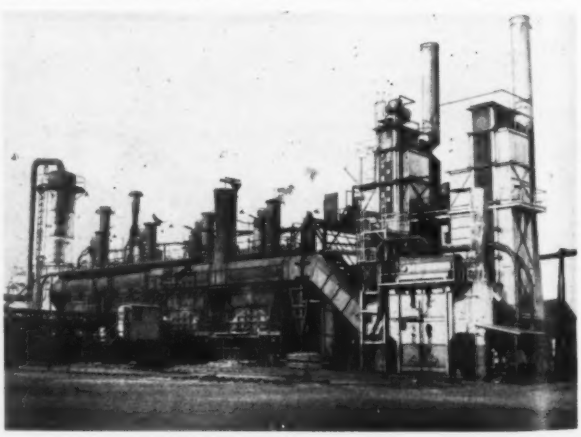
In 1923 the company began the marketing of benzol, recovered from the gas stream, which was blended with gasoline and sold as a premium motor fuel. Since 1947 more profitable markets have been found for the output of benzol in the rapidly growing chemical industry.

By 1925 the company had developed a process for treating its residual tar for use as a road binder, which was very extensively used for highway paving and maintenance. The tar output is now largely processed into a product known as electrode pitch for use in the aluminum industry, with only a small quantity being used for road binder.

The plant has been enlarged and improved from time to time by the development and installation of new processes and the adoption of operating procedures for improving gas manufacture and the recovery of residuals.

Successful development of a method of using heavy fuel oil for gas making in 1935 was of great importance. Such oil is lower in price than diesel oil or lighter grades of fuel

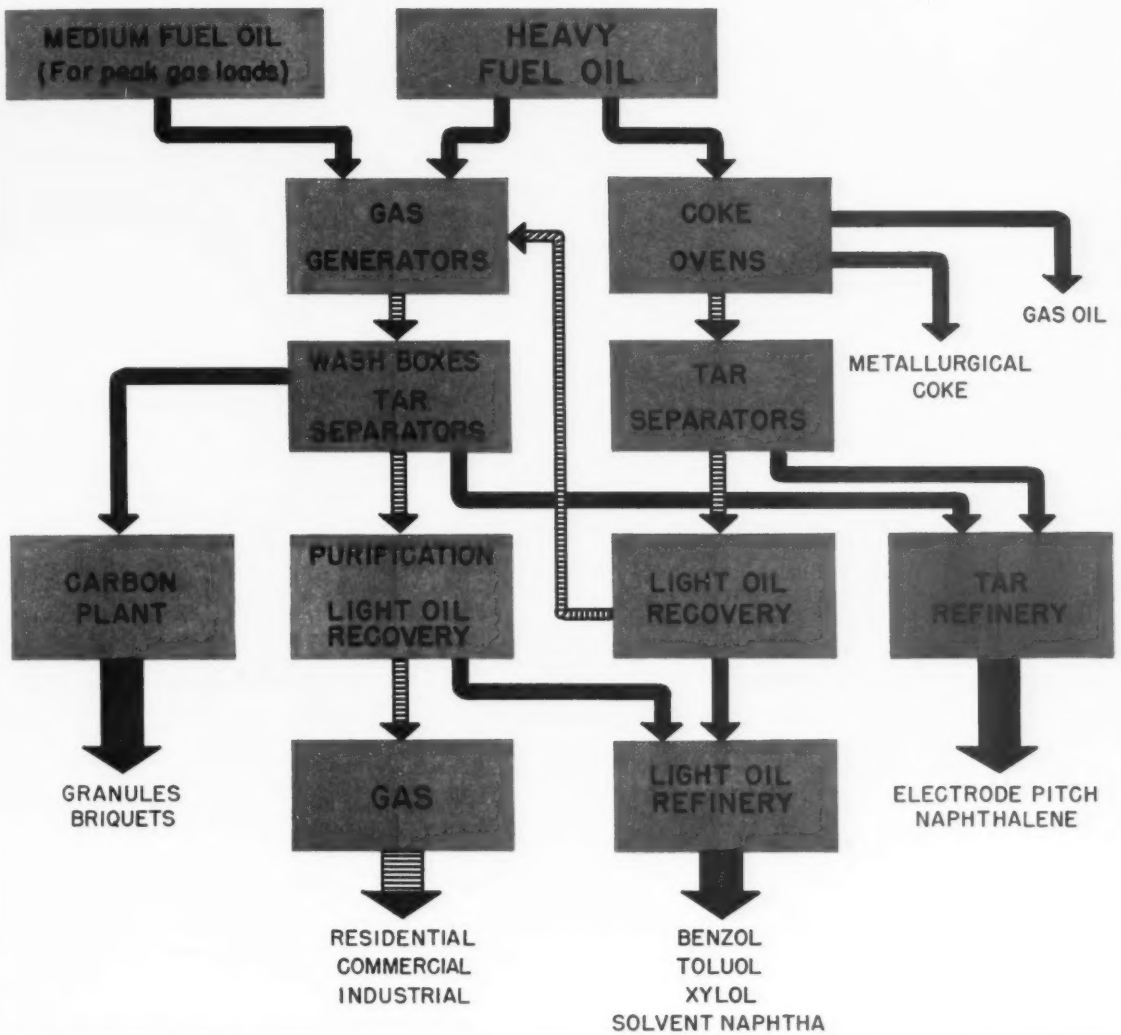
**In addition to 1030-Btu. gas, tar, light oils, and creosote are produced in a four-oven oil coke plant. It has been enlarged, improved periodically to accommodate many new processes.**



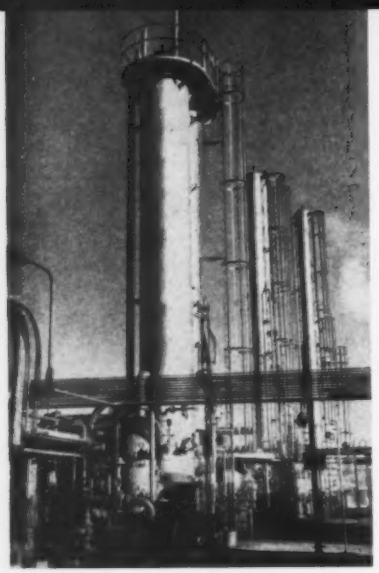
Unique in the equipment is two gas generators, 27 feet in diameter and 45 feet high, constructed of welded steel plate and containing 51,000 checker-brick each. Fuel oil is atomized with steam in these generators and vaporized as it passes down through the checkerwork, which has been preheated to between 1,800° and 2,000° F. Carbon remaining on the brick helps heat up next run.

## FLOW DIAGRAM OF PRODUCTION PROCESSES

*Dotted lines indicate the gas stream*




## GASCO BY-PRODUCTS AND THEIR USES



**By-product refinery, which will justify its existence even if natural gas is introduced into the Northwest. Meanwhile the oil gas will be useful for peak-shaving standby purposes.**

oil, and has enabled the company to recover greater volumes of by-products, and thereby to supply gas to the public at a much lower cost than would otherwise be possible.

Construction of aluminum plants in the Northwest area presented the prospect of a very large and steady market for petroleum coke and electrode pitch. This development opened up new possibilities for different oil processing methods, and in 1941 four oil coking ovens were installed to produce 950 to 1050 Btu (per standard cubic foot) gas for subsequent reforming into the 570 Btu gas required for distribution to customers, and to produce metallurgical coke and increased quantities of tar and light oil products.

### By-products and markets

The Flow Diagram illustrates generally the sequences in the production of gas and by-products. The by-products fall into three broad groups; light oil, carbon, and tar products. The uses and markets for these products are illustrated in the chart.

Generally speaking, the company has excellent markets for its products, most of which are utilized in residences and industries in the Pacific Northwest area. In this respect the company enjoys a distinct competitive advantage in that its raw material (oil) is imported in tankers with a low transportation cost, compared with most expensive rail freight on finished products brought in from a distance.

Following is a description of the processing methods and products, arranged according to major groupings:

### Light oil products

These are recovered from both generator and coke oven gas streams by conventional absorption and stripping processes and are subsequently refined into principally benzol, with small quantities of toluol, xylol, and solvent naptha.

At the present time a government agency, Office of Synthetic Rubber, takes substantially all of the light oil stream, using the benzol to produce styrene, which is required in the manufacture of synthetic rubber. Toluol has been sold for explosives manufacture, xylol for paint thinner, and solvent naptha for use in reclaiming rubber. Nearly 5,000,000 gals. of light oil products are produced yearly.

### Carbon products

The carbon residual recovered in the generator process is lampblack. This material is removed from the gas in a washbox by contacting the hot generator outlet gas stream with water. The water overflow from the washbox contains the lampblack as a slurry of 1% solids content.

This slurry is concentrated in thickeners to 10% solids, filtered to a concentration of 50% solids, and finally dried in direct fired rotary driers. The dried product in the form of granules is sold as such or briquetted, depending upon the market requirements. The finished product contains 8-12% moisture and 10-15% volatile combustible matter. Annual production approximates 110,000 tons.

Briquets are marketed principally as a househeating fuel in Oregon and Washington. This fuel is superior to coal in that it contains an infinitesimal amount of ash, burns longer, and is easier to handle. Portland Gas & Coke Company for many years has been the largest solid fuel dealer in Portland. The company has also been able to expand its industrial carbon markets, both domestic and foreign.

Petroleum coke of high purity is produced in four modified Knowles coke ovens. This carbon product is pushed from the ovens in four-ton batches at eight-hour intervals after some 4,000 gallons of fuel oil admixed with two tons of lampblack from the generator process have been fed to the ovens. The coke is then crushed, dried, and loaded into railroad cars for shipment.

This product is used by metallurgical and electro-metallurgical industries, and the company's annual production of 14,000 tons is but a fraction of the total requirements of these industries in the Pacific Northwest.

### Tar products

Tar, recovered in both the generator and coke oven processes, is processed principally into pitch for use by the aluminum industry for making electrodes.

The generator tar is washed from the gas stream with water. The resulting tar emulsion contains up to 50% water, but upon treatment with chemicals and storage at 150-200° F. for a short period of time, the moisture content is reduced to 10%. This emulsion is then steam heated under pressure in dehydration vessels, whereby a dry tar containing less than 1% water is produced.

The coke oven tar product is recovered without the use of water; hence this material requires no dehydration before processing to pitch.

Each of the aluminum reduction plants in the Pacific Northwest receives either part or all of its pitch requirements from this company.

The distillation of tar produces napthalene oil, creosote, and other tar distillates. Napthalene, formerly used as an insecticide, is now in greater demand in the dye and synthetic resin industries, and the company's entire production of 700,000 gallons annually of 80% crude naphthalene finds its way to these markets. Creosote is sold for use as a wood preservative.

### High Btu operation

In 1951 and 1952, extensive plant-scale experiments with the production of 1000 Btu oil gas, suitable for mixing with natural gas, were conducted. These experiments, using as a charging stock the heaviest type of fuel oil regularly available on the Pacific Coast, were based upon data gathered from years of research and the company's wide experience in the production of oil gas.

These test operations have been successful and leave no doubt of the practicability of producing high Btu oil gas from heavy fuel oil in the Gasco generators. The results thus obtained indicate that with or without the early introduction and distribution of natural gas, a manufacturing change to produce a higher Btu gas (not necessarily 1000 Btu) may be in the forefront of further progressive developments.

Such high Btu oil gas operation will decrease substantially the production of carbon, but will increase the production of tar and light oil products.

Rome-Turney water-cooled condenser coil. Tube is ⅝" O.D., .042" ga., bent on a 1⅜" centerline diameter. Soldered helical fins are .135" wide, spaced 14 turns to the inch. Other types of heat exchanger coils are also shown. Rome-Turney forms coils out of tube up to 40 feet long, without joints.

# For Copper Tube that can be BENT

# Rome-Turney sees REVERE

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How it is possible to make such tight turns is Rome-Turney's secret. Revere does not share in it, nor does Revere want to reveal a secret of its own, which is how we turn out copper tube in a special bending temper for an application such as this. All we can say is that the two methods dovetail very nicely. If you need copper tube that can be bent easily, and offers you as well the advantages of corrosion resistance, high heat transfer, easy joinings, see Revere. We also make copper pipe, tube in copper alloys, aluminum alloys, and electric welded steel tube. If required, the Technical Advisory Service will gladly collaborate with you, as it has with Rome-Turney, on selection and specification matters. Get in touch with the nearest Revere Sales Office.

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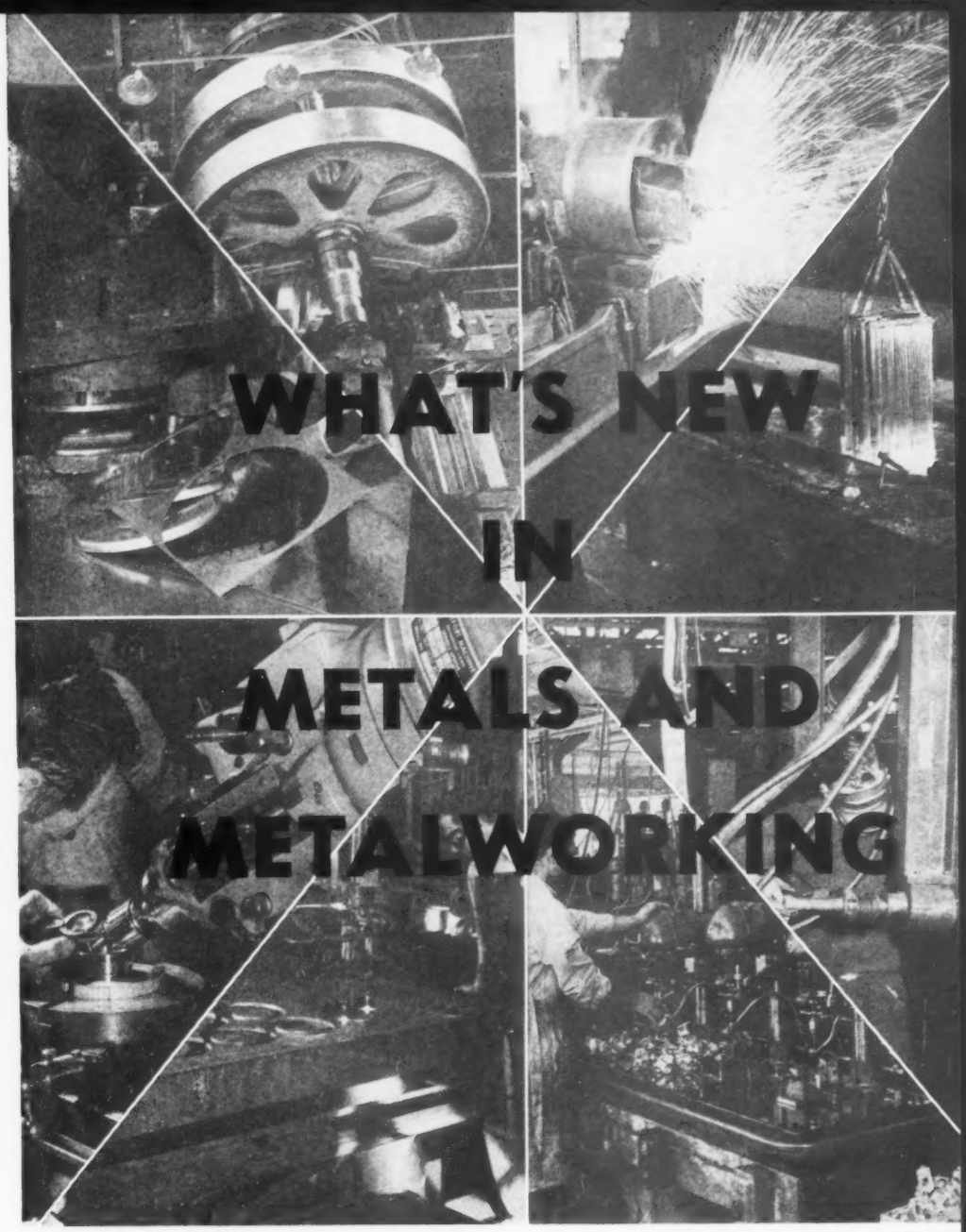


# WHAT'S NEW IN METALS AND METALWORKING

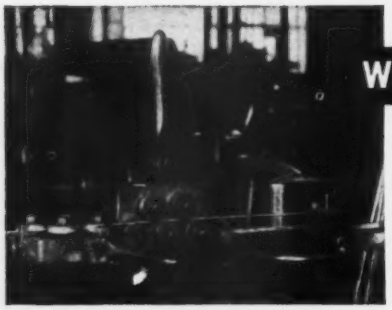
*A section devoted to recent developments in one of the many important Western industrial fields, light and heavy, which* Western Industry *serves*

# How HAYNES TRADE-MARK Alloys Combat

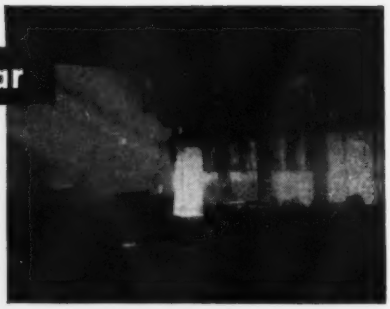
**WEAR...**

**HEAT...**

**CORROSION**



**Wear**



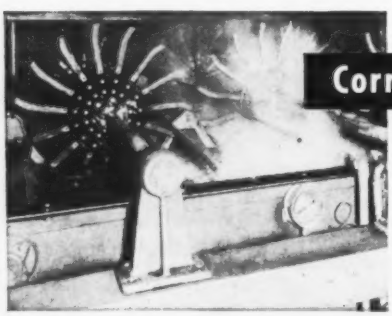
**10 Years' Service**—Wire-straightening rolls cast from HAYNES STELLITE alloy are still in good shape after 10 years of service, despite severe abrasion. Steel rolls wore out every three or four months.

**Saves $10,000 a Year**—One steel company saves $10,000 a year in down time by hard-facing tong bits with HAYNES STELLITE alloy No. 6. Steel bits last one hour; hard-faced bits last up to 50 hours.

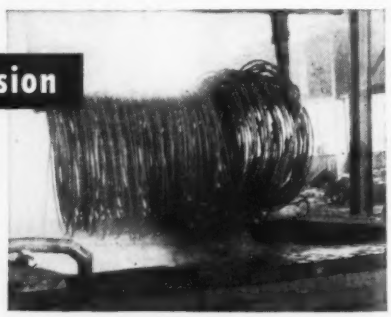
**Heat**

**Resist 1800°F.**—Used for pack annealing metal parts, the steel container at the left disintegrated in 20 hours. The MULTIMET alloy container (right) stood up for 2½ years and was still good for more of this tough service.

**Produce 300,000 Pieces**—These forging rolls, hard-faced with HAYNES STELLOY alloy C, produce five times as many brake shoe keys as unprotected steel rolls. The rolls reach a temperature of 900 deg. F., and the work 1700 deg. F.



**Corrosion**



**4 to 1 Life in Hot $H_2SO_4$**—HASTELLOY alloy paddles show no loss in cross section after carrying steel tubing in and out of a pickling solution for over a year. Other materials failed in less than three months.

**Corrosion Rate Only 0.007 in. per yr.** This pickling assembly, made from HASTELLOY alloy B plate, operates in an agitated, heated solution of sulphuric acid. Corrosion rate is only 0.002 to 0.007 in. per year.

For descriptive literature on any of the HAYNES alloy products mentioned, or on-the-job help in solving your problems of wear, heat, or corrosion, write or phone the nearest District Office.

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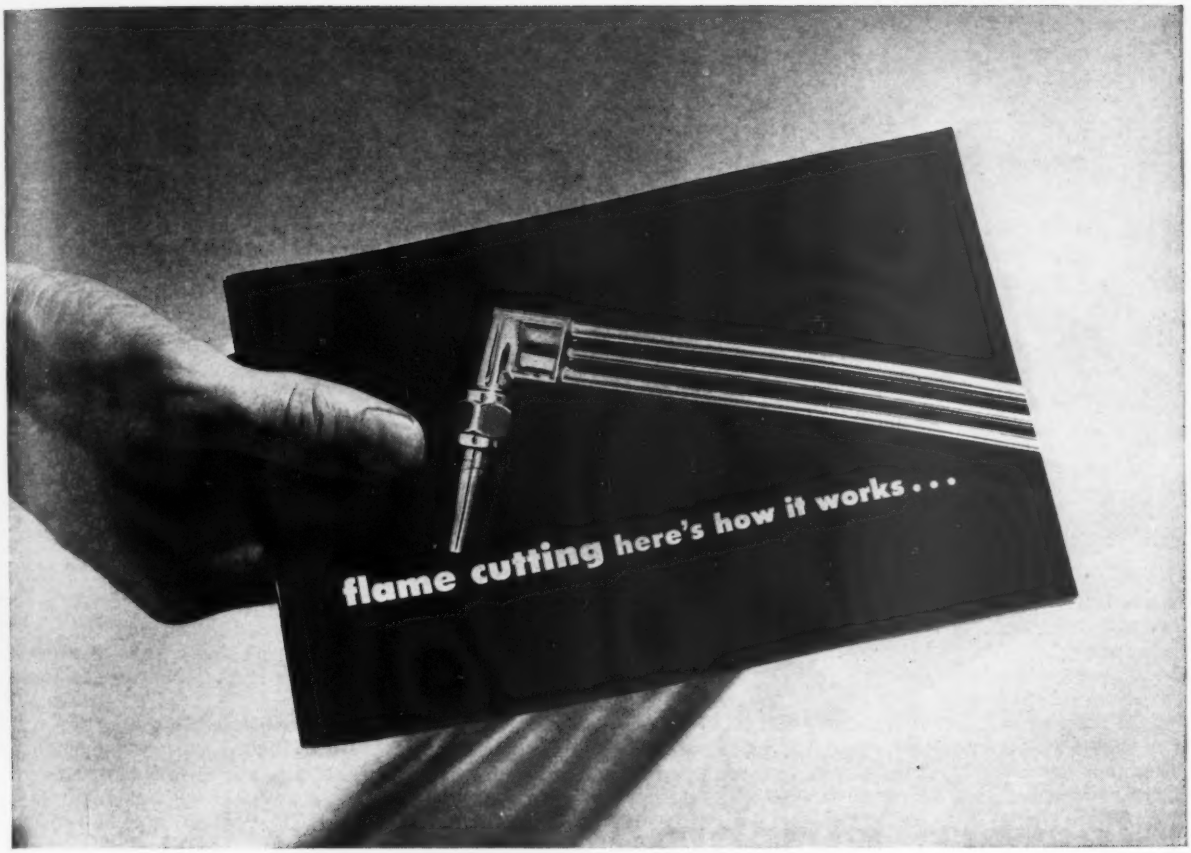


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**Here is the hand-operated prototype of the Shalco machine, designed to put shell molding within the reach of small foundries concerned with short runs.**

# Western machines for shell molding

## *Inexpensive equipment for small plants and short runs, and a completely automatic set-up for heavy production work*

TWO MACHINES for shell molding, the new process many people believe will revolutionize foundry practice because of the greater precision it provides, are being developed in the West.

One is a small machine intended to put shell molding within the reach of the small foundry for short runs, and is the outgrowth of a class project at Stanford University. The other is a completely automatic process developed by A. L. Goodreau and Edwin F. Keyes in Los Angeles for long production runs.

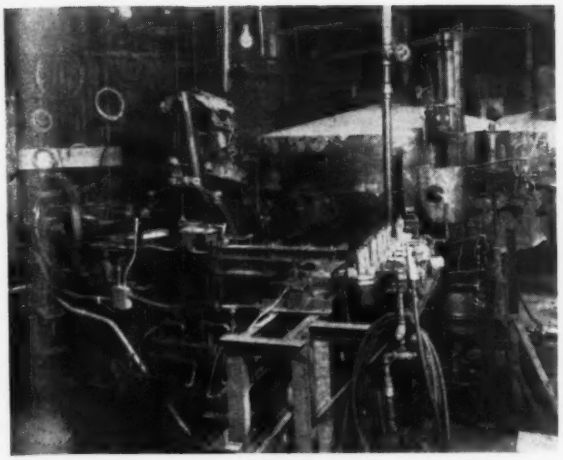
The Stanford project has attracted wide attention. Mention of it in the October 1952 issue of *Western Industry* brought in a large number of inquiries. It began with a study by Frank K. Shallenberger, associate professor of industrial management, of shell molding practices in Eastern foundries. He had his students interview foundrymen to discover why shell molding was not being taken up more rapidly in the West, and found that one of the main obstacles was the cost of installing equipment which would be too expensive for the short runs of which most orders would consist.

### Educational project

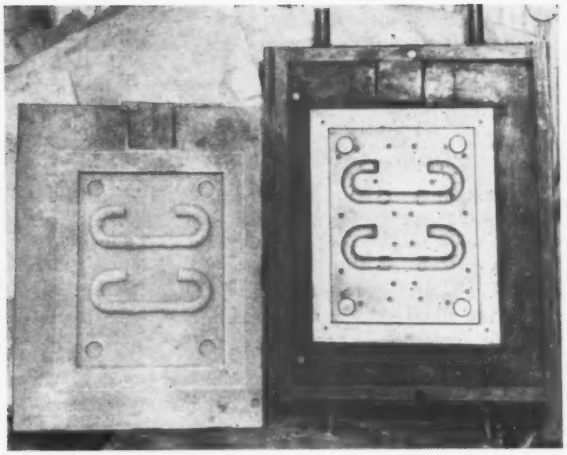
The foundry had two choices, either an inefficient manual operation or an automatic machine at a cost of $20,000 to $30,000. So they directed their attention toward building a machine efficient enough to compete effectively, flexible enough to handle short runs, and economical enough that the small plant could afford to make or buy it.

This was primarily an educational project, secondarily a service to Western industry. When the machine was complete, doors were opened to everyone who wished to see it. Upward of 200 visitors came to the laboratory to see the machine and letter inquiries have been received from as far away as Norway and Bombay.

Recently a new company was formed to take on where the student project left off, an entirely new type of machine has been developed and is now in the service-testing stage. It has the same original objectives—effi-



**View of the Goodreau-Keyes machine, developed as a service to American industry from German processes seized at war's end. Goodreau is a foundryman, Keyes an electrical engineer.**



**Pattern frame and master pattern used in their operation. Shell from this forms the back or one side from which to cast the master pattern. Their patterns weigh approximately 50 pounds.**

ciency, flexibility, reliability and low cost. It can be made to sell for the price of less than one-half that of the cheapest Eastern machine according to Professor Shallenberger, with an expected productivity about 50% greater. Selling price is expected to be around $2,400.

The company was incorporated as the Shalco Engineering Corp. of Palo Alto. Directors are Professor Shallenberger, Professor Paul Holden, J. P. Dolan, who is a Palo Alto insurance executive, and four students, Edward Krupotich, George Bingham, Joseph Fetzer and William Myers.

This machine obtains its high productivity from the use of two patterns and two dump boxes. Shells are produced alternately, the idle time during the curing of one shell being used to coat the other pattern. One oven and one stripper serve both patterns. Patterns are hinged to the dump boxes to insure positive alignment.

The machine being produced in Los Angeles is to be used by American Brass & Aluminum Foundry, and was described by Mr. Goodreau at the recent regional foundrymen's conference in Berkeley. He said it would be possible to dump into its hopper 300 pounds of sand and resin which would come back on a moving belt in the form of a shell every 15 to 18 seconds.

Terming it a "Rube Goldberg" affair because it works on a chain reaction principle, he said the pattern first passes through a circular oven to heat up, the oven temperature being 650 to 700 deg. Thence the pattern travels to the investment or dump box and then back to the oven again, the time spent in the dump box being 8 to 12 seconds and in the oven 1½ minutes. This procedure is to take care of the variation in heat required in the process.

Three arms with hands handle the hot pattern when necessary to change from one position to another. After the shells have been packed with the back-up material, they are passed on racks to a drying room to speed up the process. Hot air from the vent of the baking oven will be blown to the drying room, thus utilizing waste heat to dry the shell back-up, and it is felt that use of this method will permit castings of unlimited size.

## POINTERS ON SHELL MOLDING

By A. L. GOODREAU
and
EDWIN F. KEYES

SHELL MOLDING is going to bring back to the foundry many items which have been fabricated and forged, but it is not a panacea nor will it wholly replace other processes. Green sand will feel it the most, investment and permanent mold will have to yield to it in many instances, while die casting, lost wax and flush casting probably will feel it the least.

The principal drawback to its adoption is patterns, because the average pattern shop is not accustomed to, nor has it the equipment for making patterns to micrometer dimensions.

Shell molding has been publicized as a precision casting process, which is true under proper technique and production process practice. Shell molds will readily produce castings to a tolerance of .002 thousandths of an inch per lineal inch in dimension. But shells can only reproduce the pattern in the form that the alloy will take when the shrinkage is completed from a solid state to room temperature.

We foundrymen have produced the castings which have gone into the machines that have mechanized almost every industry, but in the main our own methods are the same as those which have prevailed throughout the history of our industry.

### Like newspaper production

Shell molding makes it possible for us to produce molds on a basis comparable to the printing of your daily newspaper.

In evaluating sands for shell molds we will have to set up new charts other than those generally accepted for green sands. We must have sand free of clay, humus and oxides and no feldspars. The finish of casting surfaces is determined entirely by the grain size of the sand used.

Do not be deceived into thinking that the high gloss, varnish-like finish of a shell means that you are necessarily going to get a corresponding finish on your castings. This appearance can be obtained and indicates an excessive amount of resin in your mix. You can produce it by dusting the pattern with pure resin before putting it on the dump box, using a parting bag in the same manner that you would in dusting dry parting on a green sand mold.

Either case will give you a high gloss varnished appearance of your shell, but in either event you will get metal penetration of the shell, when casting brasses, bronzes or ferrous alloys. In aluminum or other alloys

which have a low melting point, penetration is not a problem. However, excessive resin will reduce the permeability of the shell as will fines or pan, since they fill the voids.

### Pattern problem

In discussing shell molds with several other foundrymen who are producing castings with this process they all agree that their greatest problem is patterns. The first and foremost is the selection of a material for the pattern, the grain structure of which is such that it will withstand the shocks of raising and lowering of temperatures to which it is subjected, without disturbing its grain structure to where the grain grows until the pattern grows beyond its specified limits or its mortisen structure changes so greatly that it is impossible to hold a high polish of its surface.

Second is to choose an alloy that has a low variation of expansion and contraction in the range of temperatures to which it is subjected. Such an alloy is desirable because it is less susceptible to distortion. Since most patterns have an irregular contour, this becomes a major factor to take into consideration when specifications require micrometer limits. For production patterns we use cast iron or Ni-resist iron. We prefer the Ni-resist as it takes a much higher polish and is non-corrosive.

Next you must determine the shrink scale or factor to use in making your master pattern. First make a template of exact size plus or minus one thousandths. Cast from it in the same manner and of the same alloy that you intend to make your pattern. Heat treat, or normalize this template, mount it on a plate and make a resin shell from this pattern, using the same curing temperature that you will use in production.

### Shrink factor

Pour the shell of the production alloy, check your casting with the original template and the difference in your shrink factor. No other method can be relied upon, as the expansion and contraction of the different pattern materials vary as well as the casting materials.

By holding your production temperatures to those used in establishing the shrink factor it is possible to hold specifications to one-half thousandth per lineal inch. To be able to realize the full advantages which the process makes possible, it is almost necessary to use automatic equipment so that the temperatures and timing can be controlled within very close variables and limits.

The gating and risering will largely depend on the pouring system used. If horizontal pouring is practiced, the procedure will be much the same as green sand. However, gates and risers can be smaller, as the shell acts as an insulating riser. Vented blind risers with choke feed work ideally.

Vertical pouring offers the greatest opportunity to take the fullest advantage of the process. The hydrostatic pressure thus created, plus the permeability and insulating properties of the shell, enable you to run castings much thinner than is possible in any other casting process. Likewise, gates and runners can be reduced to about 25 per cent of horizontal green sand practice, therefore, greatly increasing your yield to melt. This effects a great saving in clean-up and melting cost.

### Close tolerances

Ordinary cores can be used and are in most instances, but core equipment must be held to close tolerances and never larger than the print, as the shell will not snuggle to the core as does green sand. If the core is ever so slightly larger than the print, you will hold the shell apart and thinning will result. Core prints can be much shorter, about one-fourth that required in green sand.

Castings can be placed much closer together, thereby enabling you to increase your production in a shell of a corresponding flask size. There are various methods of holding the shells together while pouring. In the case of the lighter metals, such as aluminum and magnesium, clamping and pasting can be used. With the heavier metals it is necessary to back up the shell with some support. Dry sand can be used where castings are not too large, but the flask must be vibrated to settle the sand as compact as possible.

### Back-up materials

Steel shot, lead shot, and copper shot is used and forms a very good backing, but should be covered with sand to avoid splashing molten metal into the shot. Steel shot is possibly the most commonly used because of its flowability. It can be readily released from the holding flask through a gate in the bottom over a pit, from which it is elevated to a bin and then directed through a hose leading from the bottom of the bin around the shells in the holding box.

This method lends itself very readily to fast production. However, as both the dry sand and shot are highly flowable, they will yield some under certain conditions which allows the shells to distort and swell. To overcome this difficulty, some foundries have backed up the shells with a core sand mix, which, when baked, serves as a dry sand mold that can be firmly clamped together, thus insuring true dimensions.

### Use of flange

The shell can be designed with a flange around the outside edge corresponding to the height of the shell over the pattern. If flattened off level while the shell is in a plastic state before baking, it will form a dished shell with an even rim which can be readily filled with a back up material with little effort and a minimum of time. Such shells can be handled with ease and clamped together in considerable number, which in turn facilitates volume production.

The Duraform Plastic Company of Redlands, California, has recently brought out a core binder which is a dry powder and has the color of cement. When mixed with about eight to ten parts sand to one of Duraform and about four per cent moisture it will set firmly in eight to ten hours in a room of about 70 degrees temperature without oven baking. If placed in a drying room of about 200 degrees temperature it will set in about 30 minutes.

It makes an ideal backing material, any cheap sand can be used and it collapses readily and can be used over again. In fact it requires about 25 per cent less binder when used over again. We are designing all of our patterns so as to adopt this method.

## Magnesium Casting

MAGNESIUM alloys can be successfully cast in shell molds, an Army Ordnance test report indicates. It makes the following recommendations:

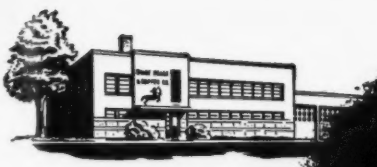
(a) Use of boric acid or Dow #181 Agent as mold washes or ammonium borofluoride as a sand-resin mix addition as inhibitor agents.

(b) Use of urea-phenol formaldehyde as shell core binders.

(c) Use of phenol formaldehyde as a binder for shell molds.

(d) Use of the hot cure, transverse strength, and permeabililty tests in evaluating shell molding mixes.

(e) Use of backing materials only when pouring large castings or castings with heavy sections.



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BRASS and BRONZE BOLTS and NUTS

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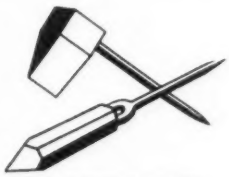
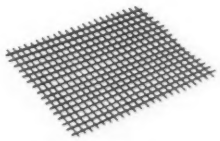


SOLDERING COPPERS



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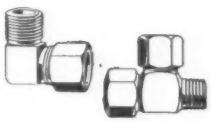

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## VULCAN FOUNDRY COMPANY

*Announces*

# DUCTILE IRON

**a versatile new metal**

After three years of experimentation and development, we are now consistently producing Ductile Iron in several exact specification ranges. This broad experience and our full facilities guarantee the casting buyer a product that combines many of the best features of cast iron, malleable iron and low carbon cast steel. The properties of Ductile Iron make this material a completely adequate replacement for many brass and bronze applications at a considerably reduced cost.

### DUCTILE IRON COMBINES

**The Best Properties of Cast Iron *plus* Many Properties of Cast Steel**

- Low cost
- Casts readily into intricate shapes
- Section thicknesses from 1/10th inch to 50 inches
- High corrosion resistance
- Excellent machineability
- Exceptional wear resistance (lubricated or non-lubricated)
- Tensile Strengths – up to 100,000 psi. as cast
- Ductility – From 2 to 25% elongation in 2" according to type and condition
- High Rigidity – Elastic modulus 23-25,000,000 psi., virtually unaffected by section thickness
- Weldability – Welds to steel and to itself.

Our experience in the commercial production of Ductile cast iron has proved to us that the applications for this material are unlimited. All inquiries will receive our prompt attention and we will gladly furnish completely documented evidence as to the physical characteristics of Ductile Iron.

**VULCAN FOUNDRY COMPANY**

4401 San Leandro Street · Oakland 1, California · KEllog 2-6260

# DUCTILE IRON—

## *The low cost and castability of cast iron with the strength and ductility of bronze*

**FOR THE PAST thirteen years Smith-Blair, Inc., located in South San Francisco, has been manufacturing water works supplies and specialties. The corporation was founded and directed by Telford L. Smith.**

By
PAUL G. DUNMIRE
Chief Engineer
Smith-Blair, Inc.
South San Francisco
California

FOR A NUMBER of years we have operated our own foundry in an effort to obtain prompt availability and better quality control on our cast iron and bronze castings. The use of either bronze or cast iron has always seemed to require something of a compromise between price and ductility. Cast iron lacks the tensile strength and ductility we require in some instances, and bronze has become too expensive for general application. As these facts became more apparent, it was agreed that a new material must be found that would combine the comparatively low cost and castability of cast iron with the strength and ductility of bronze.

### Major requirements

With this in mind, Smith-Blair engineers have watched with intense interest the development of each of the new castable metals. Early reports on Ductile Iron indicated that perhaps this material might offer the characteristics we had been looking for. About a year ago Smith-Blair started a series of comprehensive tests to determine whether or not Ductile Iron was the answer to our problem. Some of the major requirements we set down were:

1. Tensile strength in excess of 40,000 psi. (Yield point of annealed metal).
2. Elongation in excess of 18%.
3. The low porosity characteristics required by pressure castings.
4. Good castability in sections down to 3/16-in. with reasonable latitude in sectional variations.
5. Machinability comparable to good grey cast iron.
6. Moderate cost of procurement.
7. Corrosion resistance superior to cast or malleable iron.

Ductile Iron samples and considerable assistance in our testing program were obtained from the Vulcan Foundry Company of Oakland, who pioneered the production of Ductile Iron on the West Coast. Early tests indicated that we had at last found a material that exceeded the specified limits of the major requirements and after a few minor design and pattern changes would provide the basis for the production of a superior product.

### New shrinkage data

We soon found that it was necessary to establish new shrinkage data and that the shape of the casting itself became an important factor in the finished size. In general where thin sections supported bosses or large sections, difficulty was experienced. Shrink bobs placed in the feeders adjacent to these sections solved the problem in most instances.

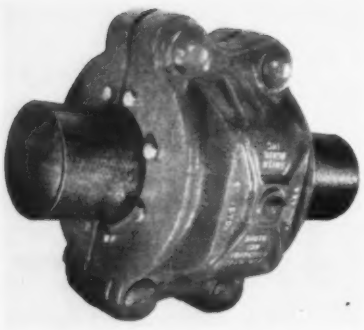
Now we feel that by the proper consideration of shrink, during the design stages very little trouble will be encountered. It was interesting that some castings were actually larger or the same size as the pattern itself, and that this was true regardless of the care in molding or the pattern equipment used.

### Machinability excellent

Machinability of Ductile Iron in the annealed state is excellent. Drilling speeds of 95 s.f./min. with high speed drills provides satisfactory tool life. We found that the use of oil in tapping assured consistently better threads than dry tapping. In a number of instances we drilled and bottom tapped Ductile Iron in the "as cast" condition with no difficulty. Apparently the close control and lack of inclusions accounts for the increased tool life we experienced.

Our first application to actual product on a quantity basis presented itself a short time after the completion of our testing processes. We were awarded a contract by the Army Engineers for special clamp type split couplings (see picture) to be placed over existing couplings on 4-, 6- and 8-inch pipes carrying high aromatic gasoline with test pressures to 1,300 psi. Ductile Iron displayed its superiority over previous materials both in physical strength and machinability. Its low

**DUCTILE IRON PRODUCTS—**
**Service clamp**



**DUCTILE IRON PRODUCTS—**
**Oven coupling leak clamp**

**DUCTILE IRON PRODUCTS—**
**Combination tapping coupling**

porosity proved it particularly adaptable for pressure castings.

Smith-Blair Inc. for many years has manufactured and sold a service clamp employing outstanding design features (see picture). This clamp, designated "Taper Seal," utilizes unique hydro-mechanical sealing plus support to the pipe on which it is installed.

In order to offer these very desirable features, a casting of larger size than used on ordinary service clamps is required. A high degree of ductility is important as these units literally wrap around the pipe and conform to the size variations encountered. Ductile Iron is "tailor made" for this product and was selected for standard use. Exhaustive testing proved conclusively that our new Ductile Iron Service Clamp is even superior to its bronze predecessor, and can be offered at a considerable saving to the consumer.

### Corrosion resistance

Resistance to corrosion, both straight and by galvanic action, has long been a serious problem in the maintenance of underground pipe lines. Ductile Iron has proven its lasting qualities, which are principally the result of the spheroidal form of its graphite. This reduces internal dissimilarity and the resulting galvanic action. Its chemical constituents are compatible with most of the normally used construction materials which should be an added incentive for its use.

Smith-Blair anticipates wide acceptance of Ductile Iron for water works supplies and equipment. We feel that in selecting this material we are combining outstanding design principles with material of the highest quality to provide the best products.

---

## HOLDINGS increase

WESTERN HOLDINGS of United States Steel Corporation common stock increased 34,853 shares in the last half of 1952, to a total of 2,248,684 shares at the year's end. Holdings of preferred stocks in the 11 Western States in the same period increased 1,819 shares, to a total of 205,215 shares.

## USES WANTED for wonder metal

IT IS MORE than two years since Aluminum Company of America widely publicized the weird properties of gallium, and now it would seem to be a "white elephant." To the researcher the attraction of this rare material is great, due to its unique qualities.

Gallium melts at about 86 deg. F., but doesn't boil until 3,600 deg. F. or higher. Like water, it expands upon solidification. It shows marked differences in electrical resistivity and coefficient of thermal expansion along the three axes of its crystallographic structure. It emits electrons at extremely low temperatures, and its electrical resistivity variability is believed greater than for any other metal.

Despite the number of applications listed there have been only a few pounds used commercially each year. The list of potential uses, and the properties which suit gallium for these uses is great, but with the cost at over $1,000 a pound very little market can be found. Alcoa is still seeking a way to put this enigma of the metal world onto the market.

## INFLATED CHAIR of plastic and metal

A NEW "buoy" chair, made by The Inco Co., Los Angeles, has been presented at the Los Angeles Winter Furniture Market. Seating portion of the chair is made of an inflated plastic ring supported by a black metal frame. Designed for poolside, beach, or patio, the chair is comfortable and serves as a life preserver when the chair is tossed into the water.

## HOW TO SOLDER copper tube joints

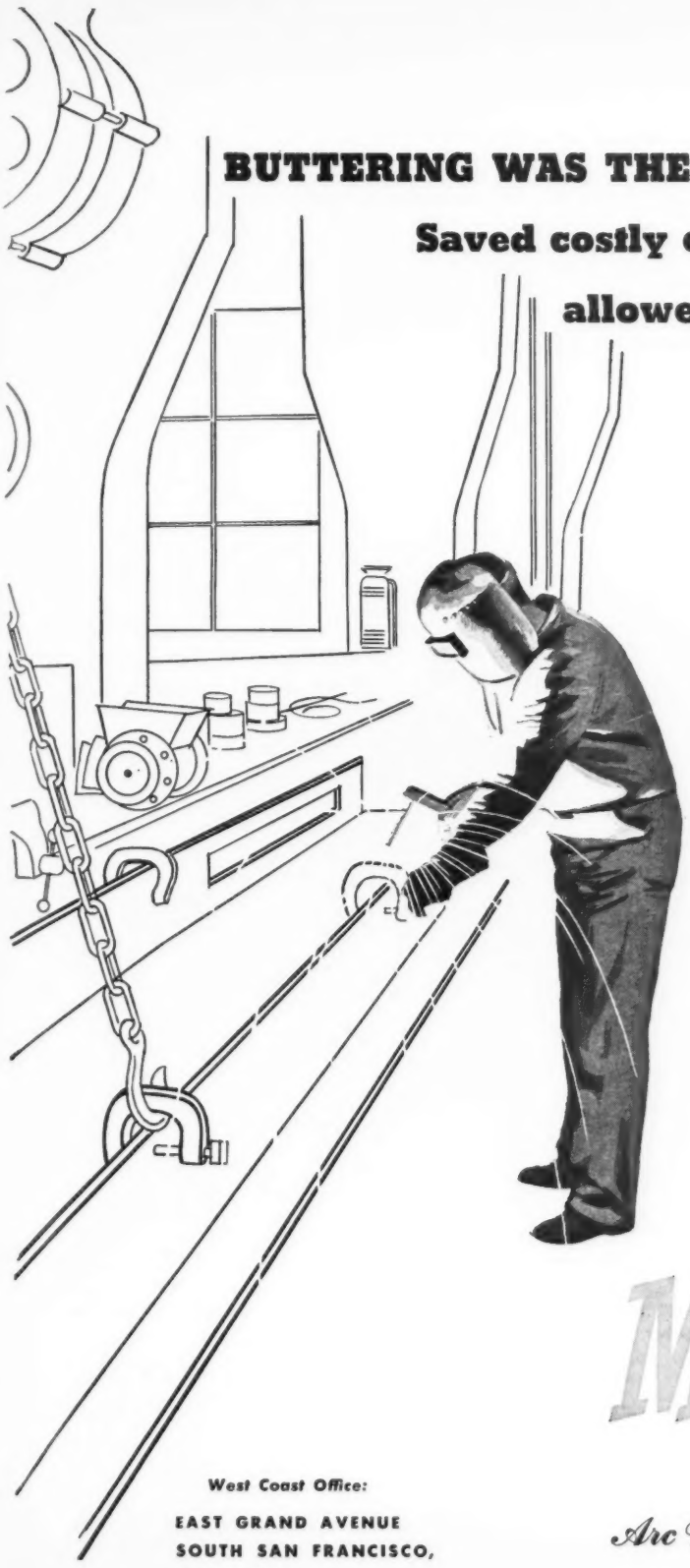
COPPER WATER TUBE and fittings designed to provide proper tolerances may be easily joined using soft solders by following five simple rules, according to John S. Coe, manager of products, Chase Brass & Copper Co.

Pretinning is unnecessary because capillary action will draw molten solder between the tube end and the inner surfaces of the fitting to form perfect, water-tight joints. Here are the five simple rules:

1. Polish outer tube ends and inner surfaces of fittings.
2. Apply a suitable flux to these areas.
3. Apply heat and solder.
4. Remove residual solder and flux.
5. Let joint cool.

Soft solder is adequate for joints in water lines where temperatures do not exceed 250° F., and there are no excessive pressures or stresses. Types of solders that may be used include 50/50 tin-lead, 95/5 tin-antimony or other tin-lead alloys.

Hard solders do not penetrate the full depth of joints as readily as soft solders but because of their physical strength nominal penetration of 3/4-in. or so is usually adequate. The high temperature required to flow hard solders also tend to anneal the tube at or near the joint so that a well-filleted joint has greater strength than the annealed tube at this point.



# BUTTERING WAS THE ANSWER!

## Saved costly casting . . .

## allowed use of low cost rods

Need for complete re-making of a large, costly composite machine frame threatened a prominent Western mining equipment builder. Weld metal was picking up harmful impurities from the cast part—it was impossible to obtain satisfactory welds using the electrodes specified.

The local M&T salesman joined with company welding engineers . . . experimented . . . and sparked a solution! On his advice surfaces of the casting where welding was required were simply "buttered" with Murex Type HTS before the bulk of the weld metal was deposited.

***Results were:*** complete elimination of pickup so that remaking of the casting to new metallurgical specifications became unnecessary. And, the specified electrodes, on hand for the job, could be used.

*Your nearby M&T representative is qualified to give you expert assistance on any welding problem. Call on him when you need help. Make use of his broad background of experience in every phase of welding.*

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**The how and why and where of titanium in airframes, according to F. Robert Kostoch, reporting to the Society of Automotive Engineers at their annual meet in Los Angeles January 12-16**

THE *HOW* of manufacturing titanium airframes has brought to light some interesting problems. One of the worst encountered is sheet stock that bends well from one surface but fails when bent from the other. So far, this phenomenon is unexplained, although presumably one side of the sheet may have absorbed more oxygen or nitrogen than the other.

The *why* of titanium is best illustrated by a comparison with several other metals. In the area between 250 deg. F. and 800 deg. F., aluminum loses its primary position in tensile strength while stainless steel, although strong enough, does not compete when measured on a strength-to-weight basis. This is the temperature range in which titanium shines. Two important sources of these temperatures are the jet engine itself and the heat-developing speed.

The *where* is shown in the motor location of a jet plane. The fuselage sections in the tail of the plane have previously been built of stainless steel which is heavy, or aluminum which cannot stand heats generated by increasingly larger jet engines. Titanium offers strength, low weight, corrosion resistance.

### Production fabrication problems

Titanium seems to stretch readily, but will not shrink well. This has been solved by either forming with greater unit pressure, or the part can be hot-formed.

Stretching is one of the most successful means of forming. It is difficult to get shallow draws without spring-back. By stretching the part, however, plastic deformation is spread out over the entire length of the curvature and spring-back is practically eliminated.

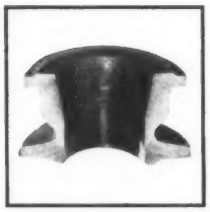
Parts have been successfully made by such conventional methods as punch and draw press, brake, drop hammer, stretch press, hydropress and hydroform. Titanium, however, seems to resist being "pushed around" rapidly, and consequently stretching, hydropress, or hydroform and draw pressing seem superior to punch press and drop hammer.

The commercially pure metal can be spotwelded with no untoward difficulty, and with adequate shielding fusion welding appears feasible. The alloy pieces, however, must be limited to assembly by bolting and riveting as a reliable production method of welding connections has been unsuccessful. While weld joints can be readily and easily made by either fusion or resistance welding process, the "as-welded" condition is very brittle and as such is not easily reconciled with ordinary engineering concepts.

The future of titanium in airframes depends on increased needs for a light heat-resistant metal which will stand increasingly severe temperatures, and new techniques and alloys which may be developed to meet future needs of a swiftly developing jet aircraft industry.

# TITANIUM

# for a customer...
# AmForge saved $39,000



This housing for an engine starter weighed too much, cost too much, until AmForge engineers redesigned it with a hole through it.

Admittedly, this case is extreme. But it is an example of the savings that AmForge has been able to find for its customers at its Upset Plant in Chicago. West Coast manufacturers can now obtain similar benefits from AmForge's new facilities at Azusa, California. Backed by more than 50 years of forging experience, this new plant will possess every modern facility for making forgings of the high and uniform quality you demand.

For this engine starter manufacturer, AmForge saved 343 tons of steel worth $39,000. The original forging required 49 pounds of aircraft quality steel to produce a forging weighing 36½ pounds. Preparatory to final machining it had been bored and faced, a slow operation. After AmForge engineers were through with it, the metal requirement was reduced to 28 pounds, to make a forging weighing 21¼ pounds. Cost of bore and face operations were cut in half. Balance of machining time was cut 10 percent.

To discover how AmForge may help you, send a blueprint, sketch or sample for engineering study—no obligation, of course.

AMERICAN **Brake Shoe** COMPANY

**AmForge Division**

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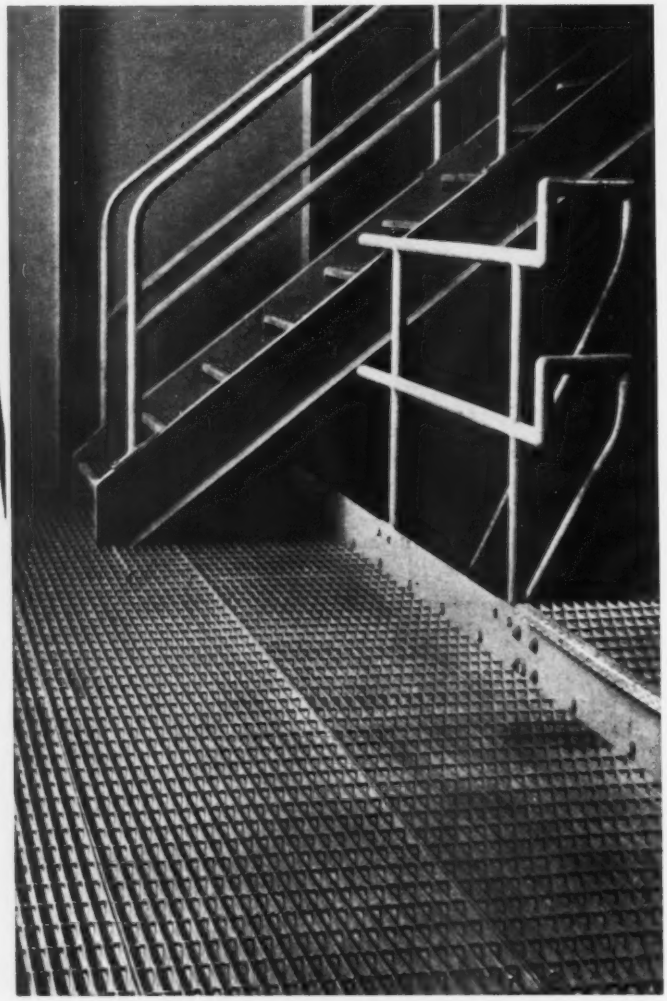
Another Typical Blaw-Knox Installation



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903 U. S. National Bank Bldg.
Denver, Colorado


## STUD WELDING on "fun tree"

**Stud welding gun, invented by Ted Nelson, is being used here. It has saved 30 to 40% labor in installing the wire mesh.**

BUILDING of a new play structure for children at an Oakland park was hastened by constructing the framework out of metal lath secured by stud welding of headless pins. A total of 2,500 ten gauge x 1½-in. pins were welded with a Nelson stud welding gun in constructing the 30-ft. long structure. By use of this method of stud welding, fabricators saved 30% to 40% of the labor required to install wire mesh, over which concrete is placed.

## NEW BUILDING techniques combined

AT THE research laboratory now being constructed for American Potash & Chemical Corporation at Whittier, California, two of the latest techniques in concrete fabrication are combined for the first time. They are the "lift-slab" and "tilt-up" methods.

In lift-slab construction, upper floors and roofs of concrete buildings are poured on top of each other, pancake fashion, and hoisted into position by jacks. Tilt-up walls are made in stacks the same way and tilted into place between floor and ceiling. Both methods have been used here before, but this is the first time anywhere that they have been brought together.

## ALCOA GRANTS 12 scholarships

A $2,400 GRANT for twelve $200 freshman scholarships from the Aluminum Company of America has been presented to the University of Washington. This is the largest group of freshman scholarships ever received by the university and will be open to any graduate of a Washington State high school.

Here are a few types of steel castings, made by Kay-Brunner for outstanding producers of oil well tools, transmission machinery, concrete mixers, trailers, excavating machinery, agricultural implements and ceramic equipment.

Some of these castings have replaced fabricated items. Some are made from plain carbon steels, some are nickel-molybdenum steels comparable to S.A.E. 4615, others of chrome-molybdenum steels of S.A.E. 4140 analysis. All have the exact physical properties best suited to the usage required of them—properties that are verified by analysis of every melt.

Whether the steel castings you need weigh a fraction of a pound or up to 2500 pounds, Kay-Brunner has the modern facilities to supply them promptly.

**KAY-BRUNNER**

**KAY-BRUNNER STEEL PRODUCTS, INC.**
**999 Meridian Avenue, Alhambra, California**

**This Greenlee special purpose machine carries out thirty-six operations on master brake cylinders at Pacific division, Bendix Aviation Corporation, North Hollywood, California. Note the inclined steel troughs which slide parts to and from the machine.**

# AUTOMATIC CONTROL

## *for High-Speed production*

HIGH SPEED automatic production of Ford and Mercury master brake cylinders comparable to any other manufacturer in the business is a day in, day out occurrence at Plant 2 of Pacific Division, Bendix Aviation Corporation in North Hollywood, California.

Pacific Division is turning out approximately 750 master brake cylinders a day which are shipped to Ford and Mercury assembly lines in Richmond, Long Beach and Maywood, California, and to Dallas, Texas. The cylinders are complete, ready for installation.

Major burden of the Bendix-Pacific production is produced on four machine tools manned by two men. Forty machining operations are performed semi-automatically on these machines with no set-up changes.

A Cincinnati Duplex milling machine handles the first operation. Castings are delivered to the machine location through an inclined steel trough, and are loaded two at a time to face off the locating points on each side of the brake cylinder. Another trough slides them to the special purpose Greenlee.

This machine was designed and built by Greenlee of Rockford, Illinois, for this one job. Basically, it incorporates two working heads, operating on either side of an indexing rotary chucking table. The machine is loaded with three banks of six castings each. There are six steps for each revolution of the table, turning out an average of 120 parts per hour.

### Twenty-nine cutting tools

Twenty-nine cutting tools carry out 36 successive operations on each casting. With each revolution the castings are transferred to a new position in the bank. The complete machinery operation is completed after a casting has made three revolutions. By staggering the loading operation a finished part is removed each time the table indexes and a new casting is inserted in its place.

### And two castings

A steel trough again slides the semi-finished castings to an Ex-Cell-O precision boring machine which finish-bores the ID of the main barrel. Two castings are handled simultaneously, being held in place by hydraulic clamps.

The fourth major operation, that of cold-rolled finishing the inside of the cylinders is done on a 2-spindle bearingize machine by means of tapered roller bearings mounted about the spindle ends.

Overhead conveyors then carry the castings through a washing process, inspection and final assembly.

*This Advertisement Is Printed on*
*No. 80 Grade Nox-Rust Vapor-Wrapper*

# Wrap Out Rust

## -with NOX-RUST Vapor-Wrapper

**Are you doing Military Packaging which requires a V.C.I. material, specification MIL-P-3420?* Do you have an industrial preservation-packaging problem?**

### Cuts packaging costs 50% and more!

NOX-RUST VAPOR-WRAPPER is the amazing, *new* chemically active paper that cuts packaging costs by 50% and more. Protect metal parts from rust without liquid rust preventives . . . simply wrap out rust with VAPOR-WRAPPER and deliver your products to satisfied customers "factory fresh" ready for immediate use. Callex, the new chemical within VAPOR-WRAPPER, which does not flake or chip off, makes moisture ladened air non-corrosive . . . surrounds and protects metal surfaces indefinitely with a rust preventive vapor, *without the need for an air-tight package.*

### VAPOR-WRAPPER protects everything

NOX-RUST VAPOR-WRAPPER keeps rust-free everything from precision micrometers to complex, heavy machinery. Packaging engineers have designed various weights and grades of papers to accommodate your most intricate packaging problem. *Now rust-proofing can be as simple as wrapping a package.*

### Available in many forms

VAPOR-WRAPPER comes in various grades in rolls, sheets, envelopes, gussetted bags, laminated cartons, and "Poly-Nox" bags—for use when product visibility is desired. For rust-proofing otherwise inaccessible areas, Callex is also available in crystalline form for dusting into minute crevices and out-of-the-way places. Callex is an *exclusive* development of Nox-Rust Laboratories and is covered by U. S. patents. Its use is not licensed to anyone in the United States.

[ Nox-Rust is America's foremost producer of rust preventive oils and coating for all your packaging problems, including those which must conform to U. S. Government and Military specifications. Ask for the Nox-Rust chart. ]

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## ENGINEERING RESULTS given for Western steel

GAS TRANSMISSION lines operate at high pressures, generally close to 1,000 psi. To conserve steel by reducing wall thickness to a minimum, high tensile strength is required. Carbon and manganese ordinarily used for this high strength presented many problems in the use of submerged arc electric welding process proposed for the work, according to W. F. Pruden speaking to the American Society of Mechanical Engineers. To insure weld strength and increase yield strength of the finished pipe by cold working, a hydraulic expanding machine was developed which actually stretches the steel and enlarges the pipe by expanding it inside of dies. Next it was necessary to design and build special machinery and equipment for the purpose. Confidence of the gas companies was justified by successful completion of a 400-mile pipeline of 36-in. pipe from the Colorado River to Los Angeles.

Extensive new housing projects are proving to be very attractive markets for finished steel products. Steel is seldom used as a direct structural material in residential construction, however butt weld pipe for water and gas distribution as well as smaller size lines extend into each building.

## ION EXCHANGE in hydrometallurgy

PRACTICAL importance of stretching our present known strategic ore reserves and making economical utilization of low-grade ore bodies, or those nearing depletion, was stressed in a paper delivered at Los Angeles by A. B. Mindler of The Permutit Co. before the American Institute of Mining and Metallurgical Engineers, Inc.

He stated that ion exchange is destined to contribute immensely to the economic solution of many problems in processing progressively poorer and more complex ores which must be worked in the immediate future. Unique properties of ion exchangers fill the gap of other unit operations which have been so well developed and so wisely employed in hydrometallurgy.

## INSTRUMENT MARKET moves to Europe

AS FAR as is known Applied Research is the first American instrument manufacturer to set up a permanent European branch for the manufacture, sales and servicing of spectrochemical testing equipment. Dr. M. F. Hasler, president of Applied Research Laboratories, Los Angeles, has just completed arrangements for setting up a new permanent ARL branch at Lausanne, Switzerland. Part of an over-all plan of expansion, branch will serve as a European headquarters for the assembly of the company's direct-reading equipment and instruments made in both Lausanne and Glendale.

## PRESSURE PIPE IS earthquake resistant

IN RECENT earthquakes near Tehachapi, Calif., transite pressure pipe withstood shocks with no breakage or leakage in the lines. Simplex couplings on asbestos-cement pipe contribute stability since this type of coupling affords flexibility at each joint. Two rubber rings within each coupling provide for flexibility of the line, and break up the rigid line of pipe so that no length of pipe can transmit its stresses to the others. Transite is being used for drainage lines, fire mains, irrigation lines, and sewer lines.

## THESE TAIL GATES are special

ELEVATING TAIL GATES with specially designed roller assemblies are being used by Consolidated Vultee Aircraft Corp., San Diego, to transfer heavy, yet delicate armament equipment from cribs to airplanes just off of the assembly line. Roller assembly on flat-bed trucks is designed so that pallets can easily be lifted by hydraulic power and rolled from lift gate onto truck bed.

### WESTERN CAPACITY PIPE AND TUBES

*As of January, 1951. Source: American Iron and Steel Institute*

| | ANNUAL CAPACITY, NET TONS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Buttweld | Seamless | Electric Weld | Spiral Weld | Galvanized | Pressure Tubing | Mechanical Tubing | Gas Weld |
| American Pipe & Steel Corp. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 13,000 |
| Basalt Rock Co. | ..... | ..... | 358,000 | ..... | ..... | ..... | ..... | ..... |
| Kaiser Steel Corporation | 135,000 | ..... | 208,000 | ..... | 80,000 | ..... | ..... | ..... |
| Pacific Tube Co. | ..... | 7,500 | 10,000 | ..... | ..... | 4,000 | 13,500 | ..... |
| Taylor Forge & Pipe Works | ..... | ..... | ..... | 36,000 | ..... | ..... | ..... | ..... |
| Cons. Western Steel Corp. | ..... | ..... | 888,000 | ..... | ..... | ..... | ..... | ..... |
| Simmons Co. | 3,100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Electroweld Steel Corp. | ..... | ..... | 7,000 | ..... | ..... | 2,000 | 5,000 | ..... |
| Southern Pipe & Casing Co. | ..... | ..... | 34,000 | ..... | ..... | ..... | ..... | ..... |
| California | 138,100 | 7,500 | 1,505,000 | 36,000 | 80,000 | 6,000 | 18,500 | 13,000 |
| Arizona | ..... | ..... | 2,500 | ..... | ..... | ..... | ..... | ..... |

### HOT ROLLED BARS AND BAR SIZE SHAPES

*As of January, 1951. Source: American Iron and Steel Institute*

| | ANNUAL CAPACITY (Net Tons) | | | |
|---|---|---|---|---|
| | Other than Concrete Reinforcement | Concrete Reinforcement | | Bar Size Shapes |
| COMPANIES | | New Billet | Rerolled | |
| Bethlehem Pacific Coast Steel Corporation | 214,000 | 161,000 | ..... | 62,000 |
| Colorado Fuel and Iron Corporation | 74,000 | 40,000 | ..... | 20,000 |
| Judson Steel Corporation | 14,000 | 40,000 | ..... | ..... |
| Kaiser Steel Corporation | 46,000 | ..... | ..... | ..... |
| Northwest Steel Rolling Mills | 17,000 | 8,000 | ..... | ..... |
| Oregon Steel Mills | 100,000 | ..... | ..... | ..... |
| Pacific States Steel Corporation | 85,000 | 30,000 | ..... | 40,000 |
| Simmons Company | 9,000 | ..... | 3,000 | ..... |
| Columbia Steel Company | 68,940 | 126,260 | ..... | 16,760 |
| Company Total | 627,940 | 405,260 | 3,000 | 138,760 |
| STATES | | | | |
| California | 386,940 | 307,260 | 3,000 | 102,760 |
| Colorado | 74,000 | 40,000 | ..... | 20,000 |
| Oregon | 100,000 | ..... | ..... | ..... |
| Washington | 67,000 | 58,000 | ..... | 16,000 |
| State Total | 627,940 | 405,260 | 3,000 | 138,760 |

**Two views of a Pacific Scientific furnace installed at Industrial Steel Treating Co., Oakland. (Left) Feeding a load of valve cores into the chamber. Sheet of flame helps keep oxygen out. (Right) Load emerges on automatic-operated tray. Doors also automatic.**

# HEAT TREATING MECHANIZED WITH AUTOMATIC FURNACES

WITH THE expansion of metal-working industries, and the increased production of materials for defense in the West, commercial heat treating is finding an increasing demand for its services.

The trend in heat-treating plants is toward automatic furnaces which will turn out work of uniform quality and on either a production or batch basis. Western heat treating includes both commercial firms, and divisions of aircraft and allied industries.

Increasingly rigid specifications both by government and private industry make necessary the use of accurate heat treatment under controlled atmosphere to eliminate surface changes such as scale, carburization or decarburization.

A most important factor to be considered in selection of equipment is maintenance, a factor ranking along with operating costs in modern furnaces. Simplicity of mechanical and electrical design is an effective way of reducing maintenance costs and increasing furnace production and versatility.

Here are descriptions of two of the many heat-treating furnaces now in service in the West. The furnaces are treated individually, and no comparison of the two is intended.

### Pacific Scientific furnaces

A new Western-designed and constructed heat treating furnace has been installed at the Industrial Steel Treating Co., Oakland, California. This one, built by the Pacific Scientific Co. at Los Angeles, is a fully automatic pusher-type with integral quench and is sealed for use with controlled furnace atmospheres. The operating temperature range is from 1200 deg. to 2000 deg. F.

### Hourly capacity

With a rated electrical input of 138 kw., the furnace will easily heat and quench an average of 1200 pounds of steel an hour. For automatic operation, the work is handled on seven heat-resistant alloy trays or baskets 31 in. wide by 18 in. long. The loading height is 15 in. In manual operation the furnace can accommodate single pieces up to 10 ft. long and 3 ft. wide.

The entire furnace, with the excep-

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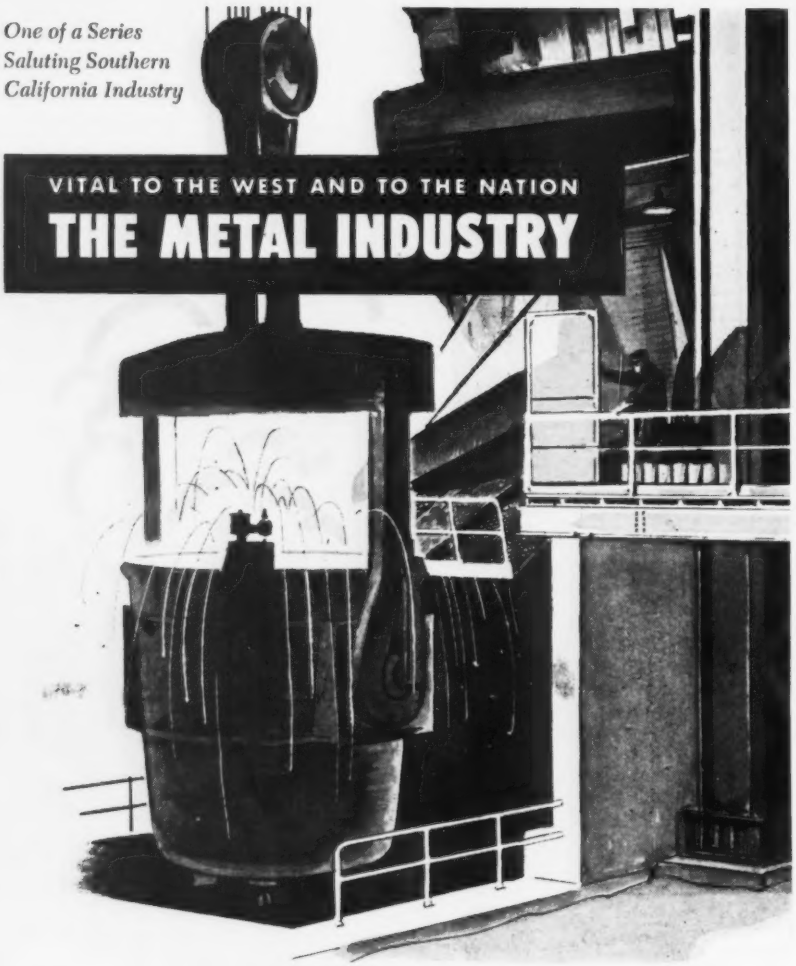


...with a manufacturing value of more than 3 billion dollars annually, represents more than half of Los Angeles County's entire payroll and industrial production.

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tion of the air-operated loading vestibule door, is electrically heated and operated. Rod type heating elements placed in radiant plates provide fast, accurate and uniform heat with long productive life and ease of replacement. Work treated in this new furnace has been clean, free from scale, carburization and decarburization. This is due to the accurate control of the heat, atmosphere and the synchronization of input, output and quenching cycles.

### Maintenance aspect

Maintenance costs on the new furnace are expected to be greatly reduced. In this pusher-type design there is little wear on the moving mechanism as no moving parts except the work and trays are exposed to the furnace heat.

There is no alloy hearth plate, normally a costly periodic replacement. The work trays are supported by alloy T-rails resting on refractory piers. This design assures rapid heat transfer and long life from the floor and wall heating elements. No maintenance or replacement of furnace parts resulting in expensive "down-time" is expected for several years.

To reduce the loss of prepared atmosphere at the door openings, the main furnace doors are adjustable to the height of the work being treated. Shallow work passes through a narrow opening, etc.

### Controlled atmosphere

With controlled atmosphere from the beginning to end, including the quench, there is no point where the work can pick up oxygen or water vapor to produce scale or other surface changes.

The quench tank is divided. The forward half is under the furnace atmosphere to protect the work just before the quench. The rear half is open to normal atmosphere to facilitate unloading.

Practical advantages of this furnace over the old manual type are obvious. One operator can load and unload far faster than was possible on manually operated units. Large or small quantities of parts, in various sizes and weights, can be heated in continuous straight line production. The operator has signal lights mounted at the loading position to inform him whether the tray is correctly aligned and when to send in the next tray.

### Other uses

Although normally used as an automatic hardening furnace with integral oil quench, the furnace is designed for annealing, stress relieving or other

*Continued on page 72*

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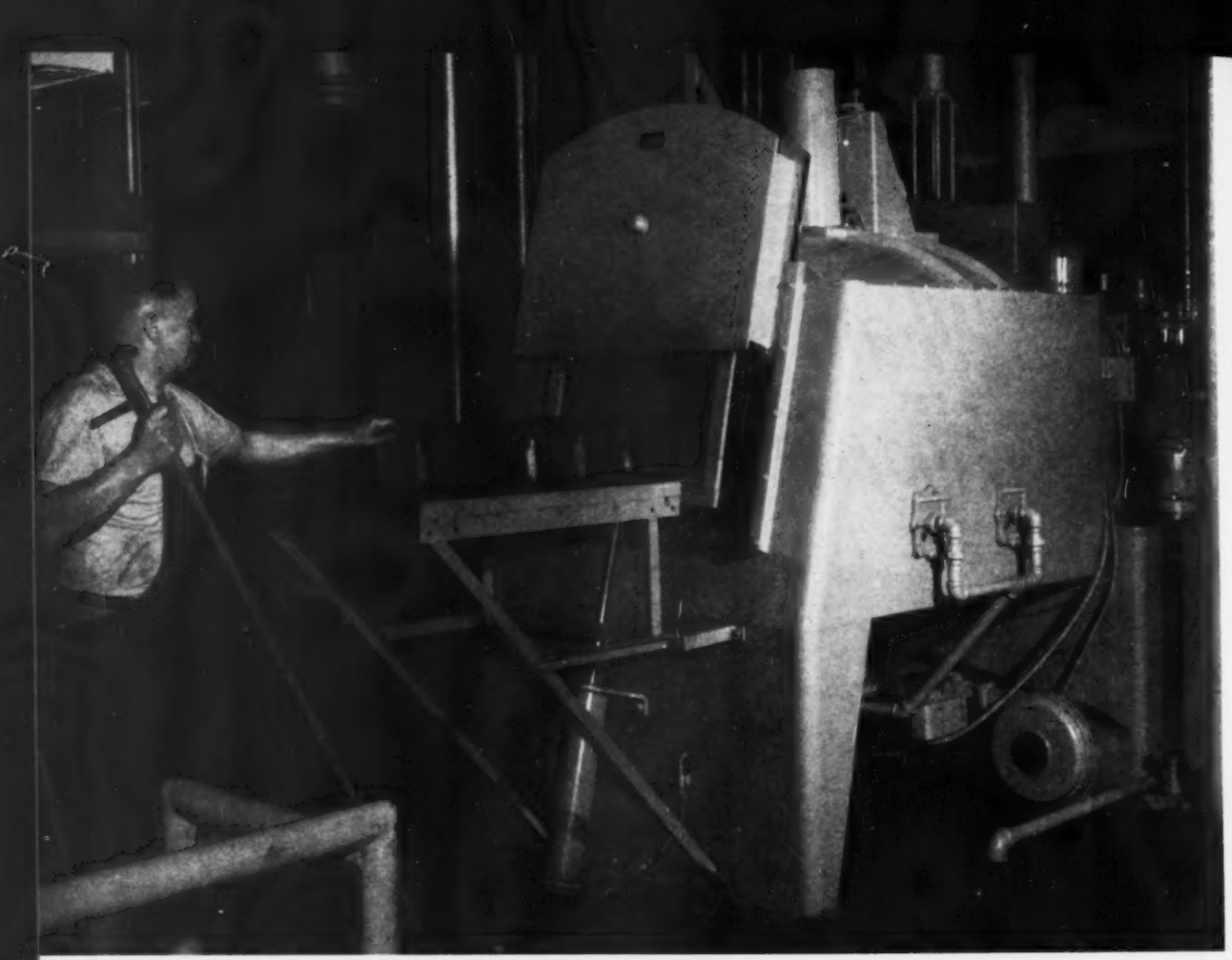


**Atmosphere-controlled, carbo-nitriding Ipsen furnace at Marchant Calculators, Inc. Features 100% forced convection heating, operating with either gas or electricity. By pre-selection on control panel, work automatically given either atmosphere cooling or oil quench.**

## HEAT TREATING

. . . Continued from page 70

operations within its temperature range requiring air or water quench. An auxiliary door in the rear quench vestibule wall permits hand loading and quenching of parts too large to handle automatically on trays.

Main furnace heating is divided into two zones, each individually controlled by its own pyrometer. This assures close control and uniform temperature throughout the entire heated length.

In the operation of this furnace, the operator lays the pieces to be heat treated on a tray or basket of special heat-resistant alloy. By placing his foot on a pedal the exterior loading vestibule chamber door opens and at the same time this door opening is covered with a sheet of flame from an automatic gas curtain in order to keep as much outside air as possible out of the loading chamber. The tray is pushed through the flame curtain and a green light indicates that the tray is correctly aligned for automatic loading. A few minutes are required to exhaust all air from the loading vestibule before the automatic cycle begins. The operator then pushes a button which opens the main furnace doors at each end of the furnace to a pre-selected height. A motor then pushes one tray along the alloy T-rails into the furnace and another one out onto the motor-driven rollers of the quench elevator. When the load is clear of the rear furnace door, the door shuts and a timer is actuated as the tray is lowered into the quench oil. At completion of the pre-set quench time, the elevator lifts the work and tray out of the quench bath into the final unloading position. The empty trays or baskets are degreased and returned to the loading position on a gravity conveyor.

Variations of the quenching procedure, including air quench under prepared atmosphere are available.

### Ipsen furnaces

A new 400-lb. per hr. automatic heat-treating unit featuring 100% forced convection heating has been built by Ipsen Industries, Inc. This versatile atmosphere-controlled carbo-nitriding furnace has been installed at Marchant Calculators, Inc., Emeryville, Calif.

The T-400 has a complete automatic straight-through operation from heat to cooling or oil quench. It is sealed to provide absolute atmosphere control during the entire heating and quench cycle, assuring bright, scale-free work on all types of heat-treating processes.

A 100% forced convection system employs the use of non-alloy radiant heating tubes, baffles, and a powerful fan mounted in the roof of the furnace. The tubes are spring loaded and positively sealed, by means of compression bellows, and are designed for either gas-fired or electric heating elements.

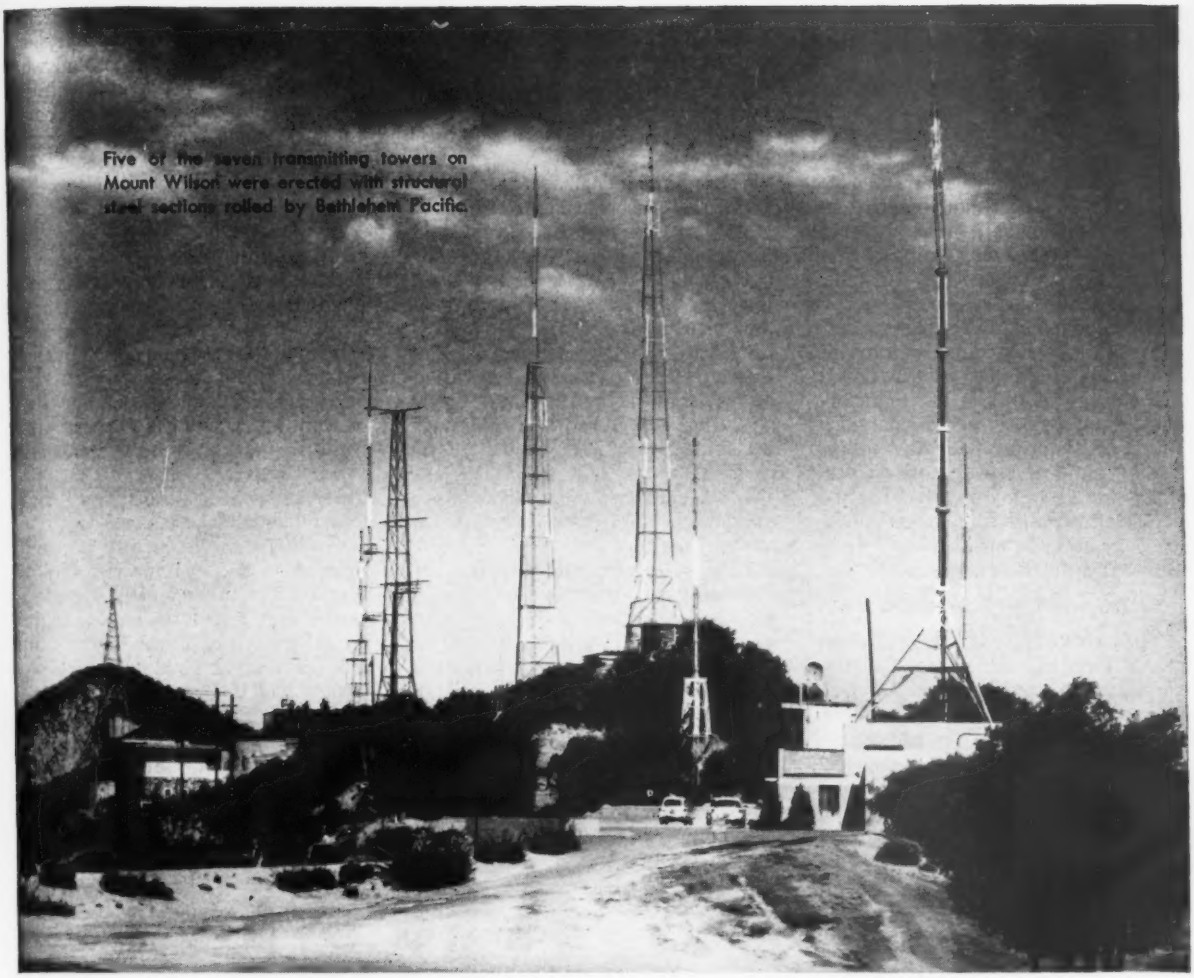
### Functions of fan

A powerful alloy fan forces the endothermic atmosphere around the baffles, past the radiant tubes, and then up through the floor and the work. The fan is short-coupled to a special slow-starting motor with water jacketed bearings and built-in safety switch.

The hearth is 2 ft. by 3 ft. by 18 in., and the maximum operating temperature is 1,850 deg. F. Gas fired, the furnace operates on 450,000 Btu., and when run by electricity at 45 kw.

The T-400 is used to normalize,

Continued on page 74



Five of the seven transmitting towers on Mount Wilson were erected with structural steel sections rolled by Bethlehem Pacific.

# World's Greatest Concentration of TV Transmission Towers

This forest of television towers has grown atop Southern California's Mount Wilson, some 6000 feet above sea level. Used by seven different stations in Greater Los Angeles, the towers broadcast video programs over an area of 10,000 square miles. This means they are within receiving range of more than 5,000,000 people.

The unusually high elevation of these towers has added considerable distance to the effective transmitting range of the Los Angeles stations. And their concentration on one mountain top has simplified the tuning problems for the vast television audience of the region.

The towers are, of course, made of steel. No other material would be practical for building structures of this height, with the strength and rigidity required for television transmission. Five of these seven towers were erected with structural steel rolled by Bethlehem Pacific.

This company, with its three structural-steel rolling mills, its four fabricating works, and its erection facilities, is handling steelwork for almost every kind of industry located west of the Rockies.

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BETHLEHEM STEEL

## HEAT TREATING

. . . Continued from page 72

stress relieve, harden carburize, carbonitride, and braze. The unit can be supplied with a special insulated tank for martempering or hot oil quenching.

This Ipsen unit is easily installed or relocated. It is floor mounted, with no pits to dig, and units are completely piped and require only simple service connections to complete the installation. A minimum of floor space is needed due to compact design.

Work is loaded directly into the heating zone, and after proper time at heat, the work tray is automatically transferred onto a quench-cool rack which holds the load for atmosphere cooling, or lowers it for oil quench, whichever has been pre-selected on the cycle control panel. As soon as the tray is on the rack, a new load can be put into the heating zone immediately.

### Tray moves automatically

The work tray is automatically moved from the heating zone to the quench zone by the patented and unique cold-chain transfer. Chain life is lengthened and maintenance reduced because hot links never take the load.

As the heating cycle ends, the hot portion of the dual sprocket-driven endless chains moves freely beneath the work tray in a recess, and the cold portion of the chain loop comes into position to take the load. Raised lugs contact the tray and push it onto the elevating rack in the quench zone. The use of dual chains insures centering of the basket during transfer.

If work is oil quenched, the rack automatically lowers the tray into circulating oil. The settings on the quench cycle times control two-speed flow motors to provide any combination of drastic, moderate, or slow quench. Dual propellers located at both sides of the tank circulate oil past a curving baffle and downward through the load for positive quench of all parts.

Built-in heating and cooling coils in the quench tank provide complete oil temperature control. The elevating rack, as well as the intermediate door, is airdraulically-operated for smooth, shockless operation. If the work is to be atmosphere cooled, cycle control maintains the rack in raised position above the quench tank. The cooling chamber is water-jacketed with automatic controls to maintain the proper temperature.

Settings on the cycle control panel are fast and simple, allowing for easy change-over from one job to another. Once set, the cycle automatically controls the time, temperature and work movement through heat quenching or cooling. Atmosphere controls are easily set and change-over from one process to another is accomplished by setting the flow valves of the enriching gases.

### Atmosphere sealed

The entire quench zone, like the heating zone, is completely atmosphere-sealed, and the heat treated work remains bright and scale-free after atmosphere cooling or oil quench. No subsequent pickling or blasting operations are required before plating or painting. The finished piece is now ready to be shipped to the customer and put into service.

Marchant Calculators, Inc., have found modern atmosphere-controlled carbo-nitriding heat-treating units superior to the cyanide-salt type of furnace. The quality of heat treating of flat and round steel parts is improved by this new type furnace, and shot blasting, or pickling, which previously had to be performed to promote good plating, is now eliminated. They also have found the straight-through design advantageous as it enables the loading of baskets, racks or rods to be a line production operation.


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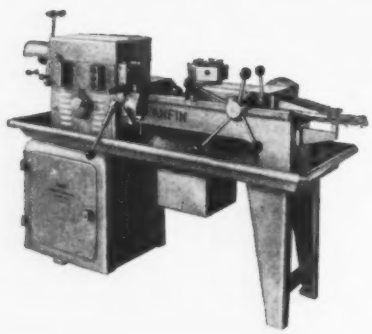

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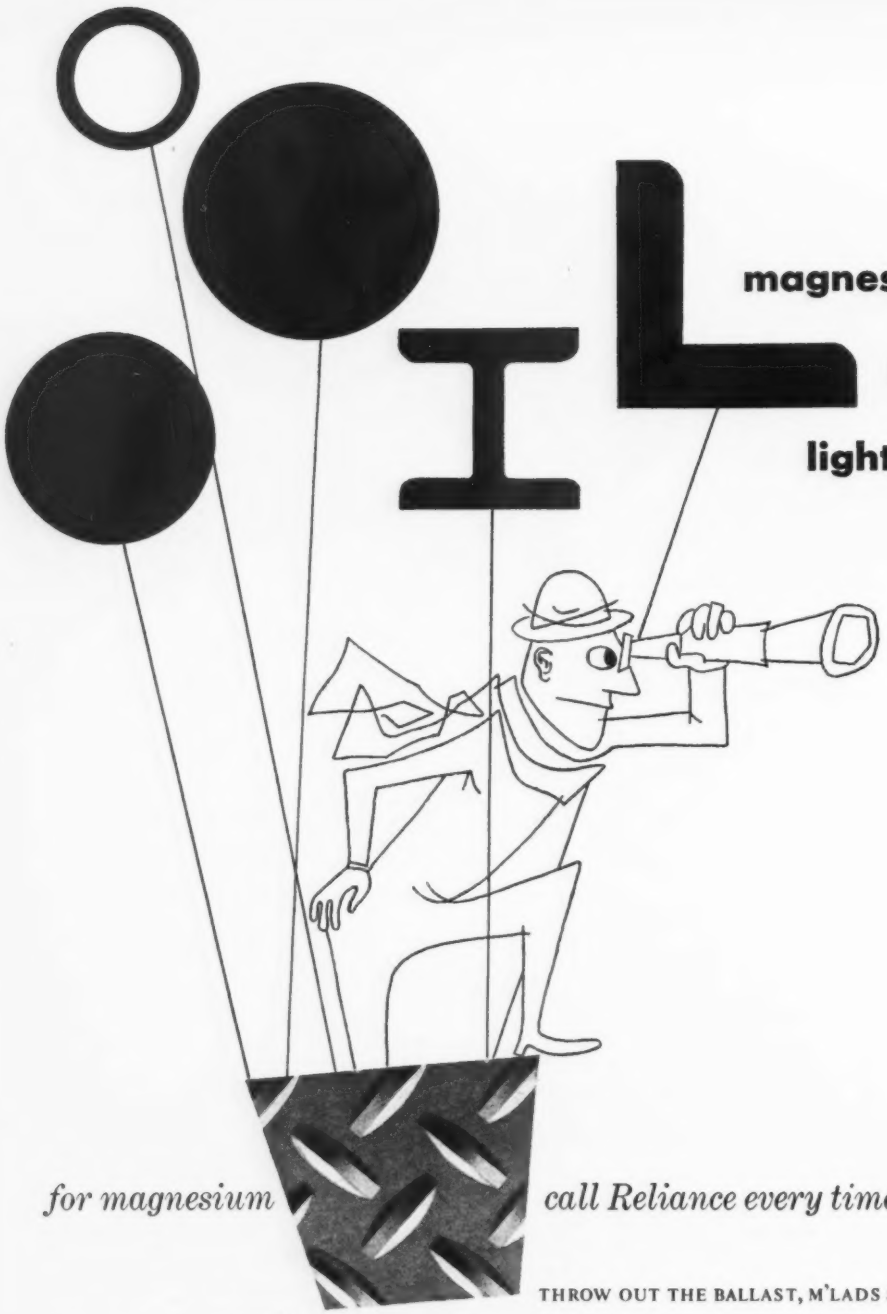

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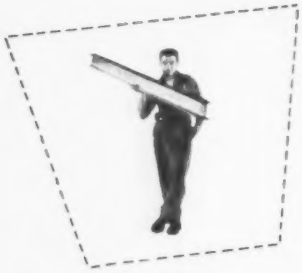

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# WHAT'S AHEAD IN METALS

*Exclusive reports from Western chapter chairmen of American Society for Metals paint tomorrow's metalworking picture*

## Expansion puts new demands on producers and fabricators

By W. J. HOLTMAN, *Chairman, Rocky Mountain Chapter. Metallurgist, Denver & Rio Grande Western Railroad, Denver.*

THE DEVELOPMENT and increasing growth of the Western metal working industry is indicated by the threefold increase in metal warehousing facilities in the Denver area in the past ten years.

This has been brought about in part by the demands of numerous small manufacturing concerns which are fabricating such diversified items as fish hooks, line guides, spinning reels, power wrenches, hose clamps, etc. In addition, the tremendous growth of the oil industry, transportation industry, and the building trades is requiring steel on a larger scale.

New demands are indicated by the shale oil industry in western Colorado and a new atomic installation west of Denver. Engineering plans formulated by the U. S. Bureau of Reclamation located west of Denver require great quantities of constructional metals for completion of projects dedicated to the development of Western water resources.

A modern seamless tube mill is being erected at Pueblo as a further expansion of the Colorado Fuel and Iron Corporation to answer the needs of the oil exploration and refining industry.

The important quest for uranium had led to an enormous amount of prospect drilling in the "Four Corners" area, utilizing diamond and percussion drilling equipment. Drill rods and tubing for this effort are being produced largely by local industry.

Advances in the foundry industry are indicated by the operation of a large foundry devoted to precision casting of aluminum pistons and another found in tonnage production of nodular iron from a basic lined cupola.

Research advances are shown by the recent addition of an electron microscope to the facilities of the Denver and Rio Grande Western Railroad Laboratory.

The greatest need in satisfying the expansion of the metal working industry is in the increased education concerning properties and application of metals. The Rocky Mountain Chapter of ASM yearly organizes and conducts an educational series in conjunction with local universities to answer this demand. The outstanding success of this joint endeavor is indicated by the continuing capacity attendance of representatives from local industry.

## Low-alloy steels invading the heavy-duty field

JOSEPH C. THOMPSON, *Chairman, San Diego Chapter; Metallurgist Engineers, Material Engineering Section, U. S. Navy Electronic Laboratory.*

RECENT DEVELOPMENTS in iron and steels have been spurred on by need to save alloying elements and to obtain strong materials which retain strength at higher temperatures.

Studies indicate that a low-alloy titanium-boron steel is capable of replacing high alloys in jet and rocket applications. The alloy has the strength necessary and is relatively easy to work.

It is likely that the alloy content of steels for most ordinary uses, even where high strength is

needed, will remain low. Makers of heavy-duty equipment such as tractors and road-building equipment have found that by more careful heat-treating, finishing and design, mild steels are capable of taking over the jobs once filled by high-alloy steels.

The shift to straight chromium stainless steels will build up. Type 430 stainless has served as a satisfactory replacement for the 18-8 stainless in many applications and more plants are learning how to use it.

### Many two-metal combinations

New uses, such as clad metals of all types, continue with the development of a copper-clad steel plate which is intended for applications involving heat transfer, conductivity or corrosion resistance where the strength of steel is needed with the favorable characteristics of copper.

Now there is a selection of many two-metal combinations, such as stainless and mild steel, steel and copper, lead and steel, copper and aluminum, plastics and metals, wood and metals.

Nickel-chromium-iron in the high-temperature field appears promising for application up to 2,200 deg. F., where good weldability may be maintained, including creep strength.

The use of aluminum will continue to grow in military and civilian applications. Aluminum is stepping into locations formerly handled by metals that are still scarce. There are two new corrosion-resistant aluminum alloys intended primarily for welded assemblies such as pressure vessels, tanks and transportation equipment.

### New uses for alloys

New uses have developed for the alloy of copper, nickel and silicon where a high resistance to stress corrosion is needed. In the bronze field, an alloy of copper containing tellerium, nickel and phosphorus called technic-bronze, has excellent machinability, good hot and cold workability, good electrical conductivity, high strength, age hardenability, high fatigue strength and good corrosion resistance, and can be hardened by heat treatment.

Production of ductile titanium and its alloys is rapidly developing. The aircraft industry in particular is interested in this metal because of its strength-weight ratio, its intermediate temperature properties and its resistance to corrosion. Already some aircraft have a few titanium parts, and the chances are that more are to come. Meanwhile, research continues as to less expensive ways of reducing the metal from its oxides toward the best alloys and to find the best method of fabrication.

The steady flow of sheet and plate magnesium in thickness of 3/16 in. from the rolling mill will increase the applications as it is now offered at a price per pound equal to that of aluminum. More plating is being done on magnesium parts, making possible more decorative or processing applications.

Germanium will demand attention as its use in diodes, rectifiers and transistors for radar and other electronic applications. The future in germanium lies in its promise to replace vacuum tubes for many functions, and the reduction in the size of certain equipment.

The increase in use of transistors will have a profound effect on materials such as nickel and tungsten requirements for vacuum tubes will be cut tremendously.

Southwestern fabricators feel a need for more knowledge on the interchangeability of steels, and the latest know-how of materials and substitution. We must devote our time and energy toward improving designs and fabrication methods. To serve this need, the San Diego chapter of the American Society for Metals has for the past three years held spring lecture series on characteristics of engineering materials substitution and fabrication. This has been open to the metal men in this area with no admission charge.

Our attendance for the lectures this year exceed the 5,000 mark. These lectures have proved to be very valuable to our southwest metal fabricators, aircraft industries and Naval installations.

## Growing opportunities for Western metal industries

By H. Edward Flanders, *Secretary-Treasurer, Utah Chapter. Professor of Metallurgy, University of Utah*

METAL INDUSTRY in the West is booming. Steel is being produced in large but insufficient quantities. Most of the nation's copper and much of its lead and zinc are produced and some refining is done there.

Cheap power produces aluminum and magnesium. Reserves and production of uranium and vanadium are expanding. Molybdenum and rhenium come from the copper industry, and selenium, arsenic, antimony, bismuth, and thallium from lead and zinc smelting. Cobalt is being produced in a new refinery as an essential element in gas turbines.

The fabrication industries, such as stamping, drawing, spinning, wire drawing and weaving, welding, machining, forging, extrusion, casting, rolling offer great opportunities which will expand immeasurably when the market in the Orient becomes stabilized. Many large companies anticipate this and are building plants and research departments in this area. The requirements of the Atomic Energy Commission in materials and research have only begun. The aviation industry ranks high with its complicated shapes and mechanisms.

It can be expected that the major part of the fabrication industries will be with iron, copper, aluminum, lead and zinc, with the more rare elements entering into special but highly profitable service.

The economic use of these metals demands that producers and fabricators be thoroughly conversant with the properties of these metals and their alloys in production,

Continued on page 80

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(See page 165)

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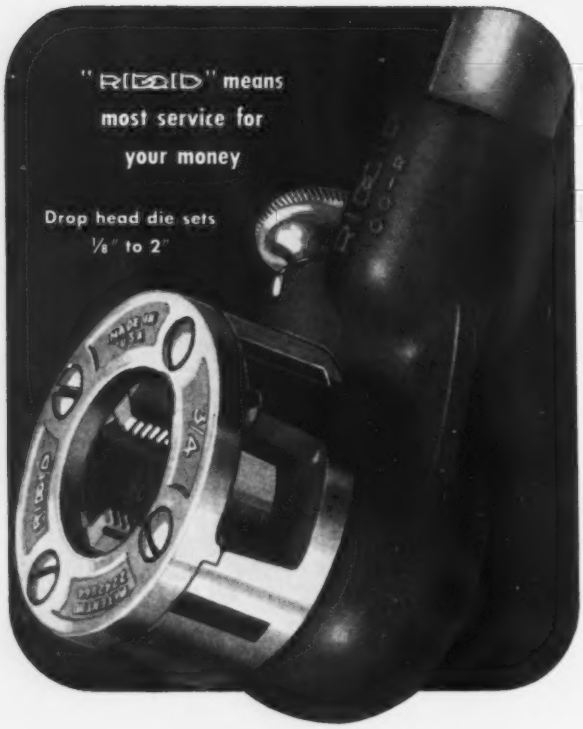


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## WHAT'S AHEAD IN METALS

. . . Continued from page 79

fabrication, and service. This requires a wide knowledge of physical metallurgy. There is a place for skilled technicians and advanced theoretical training in research and management.

There is opportunity in the West as it becomes industrialized.

### Demand for consumers' metal products multiplies

By F. L. STAMM, *Chairman, Los Angeles Chapter. Vice President, General Metals Corporation*

PROGRESSIVE Western movement of population has brought the Western States, and particularly Southern California, a great number of new industrial enterprises, all of which are consumers' metal products.

The significant trend in the past few years has been the expansion of the automotive industry's product requirements from Western sources. The need for standard consumers' goods on the West Coast has multiplied to a point where economical production may be made.

Production know-how, to obtain the utmost from the use of our metals, is now required. Increased demands in the physical properties of our structural steels from the aircraft, oil field and automotive industries require much better control in their making and processing. The need for cost reductions has stimlated the use of hardening agencies, such as boron.

Higher strength and lower weight has brought into use in the aircraft industry a new metal called titanium. As yet this metal is an infant in our production requirements; however, it seems to be growing rapidly.

The increase in demands made by the high work loading required of our existing machinery has made it mandatory that industry use the available materials to their best advantage. Research and development work must be carried out to provide lighter, stronger materials to fulfill these demands and support our economy.

### Expansion coming in light metals fabrication

F. H. ELLINGER, *Chairman, Los Alamos Chapter. Metallurgist, Los Alamos Scientific Laboratory, Los Alamos, N. M.*

SINCE MANY of the factors contributing to the general industrial growth of the West appear unchanged, this growth is expected to continue with a proportionate expansion in metal fabrication, particularly in the light metals field.

New uses for the common metals, I believe, must await the more general availability of these metals. It is expected that new uses of the less common metals will result from the research and development now being devoted to them.

Of these, titanium seems to still hold the spotlight. The

outstanding characteristics of strength-weight ratio and corrosion resistance of titanium and its alloys recommend its application to many fabricated items. The problems concerned with the fabrication of titanium are gradually being solved, and this know-how will encourage its use where the comparatively high cost can be justified.

I do not believe that the new metals such as titanium show the greatest promise of future development, but rather the metals that are now in common use, such as the steels, aluminum and magnesium. It has been shown that, in some cases, the low-alloy steels, by means of improved methods of processing and heat treatment, can be made to fulfill the requirements formerly believed to be obtainable only by the more highly alloyed steels.

Likewise, I believe that aluminum and magnesium alloys will find use in applications formerly thought to be outside their sphere of usefulness. Cladding and surface treating will also extend their range of applications.

I do not know along what lines Western fabricators most need to be educated, but I do believe such effort could be directed profitably toward as complete as possible understanding of the characteristics of the metals and alloys with which they work.

## Magnesium and aluminum lead Northwest expansion

By S. A. DURAN, *Chairman, Inland Empire Chapter. Assistant Professor of Physical Metallurgy, State College of Washington.*

THE METAL INDUSTRY of the Inland Empire has made remarkable progress during the last two years. Much of the impetus for this growth has come from the expansion in the light metal production capacity of this region.

Attracted by the great power potential of the Pacific Northwest, a newly-completed aluminum reduction plant has begun producing aluminum, and an expanded magnesium plant is reducing a sizable amount of magnesium for this country's defense needs. The major trend continues to make the Northwest an important light metals center for the nation by adding newer facilities to the previously existing aluminum reduction plant and the aluminum rolling mill, the largest of its kind west of the Mississippi River.

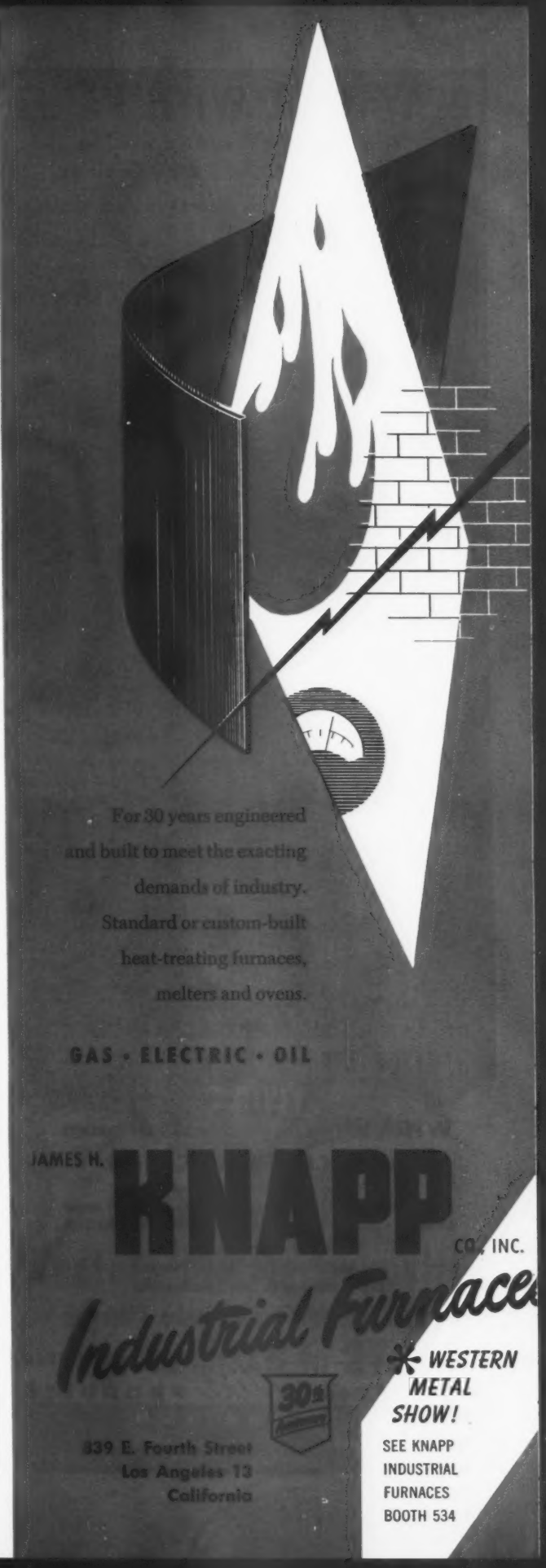
Together with these newer developments, a great many manufacturing plants, small and large, have started operations to influence the economy of this region. The small jobbing shops and foundries and the expanded manufacturing plants are producing a variety of metal products, from defense to consumer products.

The area's industries will continue to improve their methods, to increase their production and to adopt better quality control measures in order to obtain contracts from the Western aircraft manufacturers and other defense industries.

Separated from the eastern influence and with a lack of heavy production equipment, the region's manufacturers are using ingenious fabrication methods that are quite unconventional. Some of these methods will undoubtedly need extensive development to compete with the existing methods, but they are definitely adequate to fill the needs of the regional consumers.

For instance, cartridge cases of special calibers are manu-





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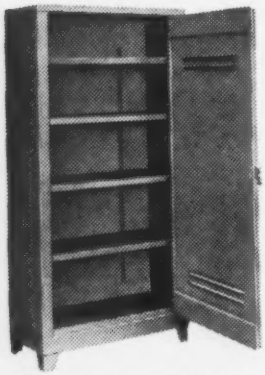

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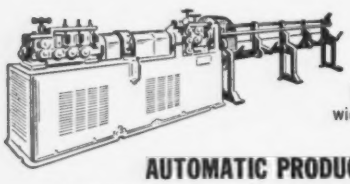

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factured by impact extrusion rather than by deep-drawing processes, and aluminum couplings for the irrigation pipes are cast with the use of phenolic-resin-bonded shell molds instead of sand casting methods.

Aluminum is still the most important metal cast and fabricated in the Inland Empire. Its use is growing and will continue to grow on the newer farms made possible by the Columbia Basin irrigation project and in the various industries of the region. More of this light metal will be needed for the fabrication of trailer trucks, small boats, irrigation pipes, sidings, roofings, frames, architectural trims, and other products for the various industries, such as the lumber, paper and dairy industries.

A new development is the production of steel castings for the mining industries by one of the iron foundries of this region. The demands of the mineral industries for steel castings produced not far from the mines and mills will continue to grow and influence the foundry industry of this region.

The technical knowledge in the selection of alloys, forming and fabricating processes, heat treatment and finishing methods are seriously needed by the majority of producers. A greater emphasis must be put to enlarge the capabilities of these men by various means of training.

Some manufacturers who could not afford to employ metallurgists on their permanent staffs must be convinced of the value of seeking help from the competent consultants in the field. Recognizing these problems, the Inland Empire chapter of the American Society for Metals, with the cooperation of the Metallurgy Department of the State College of Washington, has emphasized the importance of the selection of alloys and the metallurgy of aluminum in its educational program.

With the ever-increasing demands of the Western industries for trained technical men, we must make plans to encourage our young men to think about a career in the metal industries. We must train our own engineers and scientists instead of trying to obtain men from the East where the shortage of personnel is just as serious.

## Western fabricators close gap on Eastern competition

By Blake D. Mills, Jr., *Chairman, Puget Sound Chapter. Professor of Mechanical Engineering, University of Washington*

ABILITY OF WESTERN industries to fabricate their own metal products has been improving at a rapid rate. Recently expanded facilities in the West for the production, rolling, extrusion, drawing, and other fabrication of metals have had a healthy effect toward decreasing our dependence on overloaded Eastern plants. The initiative and ability of Western operators is being well evidenced by these new developments, including increased shipments of fabricated products from the West to the East.

While new civilian uses for metals must necessarily be restricted by the requirements for National Defense, some new applications are resulting in savings of critical metals and other materials. This sort of application needs more emphasis in these critical times. The use of light metals, and light-weight design with iron and steel, for example, has resulted in marked savings of both metals and fuel in the transportation field.

Another example is the recent advent of "pre-stressed" concrete, which, by substituting high-strength steel for a much greater weight of conventional reinforcing steel, may release considerable tonnage of steel for other essential uses.

The work of the aircraft, defense, and atomic industries, in pioneering the usage of remarkable new metals such as titanium and zirconium, is resulting in more economical production of these metals, toward the time when they may take important places in civilian industrial uses. The taxpayer who is financing the development of these new metals should ultimately receive benefits from them in addition to the national security of his country. The defense-born philosophy of developing new materials first and finding uses for them afterward, while initially expensive, should result in eventual economy.

Toward conservation of metals, and in order to meet Eastern competition. Western fabricators need to extend their efforts to use metals as effectively as possible. Products must be designed for efficient and economical usage of metal, not merely conceived and put together so that the product will work. Man-hours and money spent in carefully planning the design and fabrication of metal products can result in both metal conservation and profit to the manufacturer, and metal fabricators must insure their awareness of this fact.

## Demand for trained metals men gets bigger and bigger

By ROBERT A. JOHNSTON, *Chairman, Golden Gate Chapter. Metallurgist, General Metals Corporation, Oakland.*

ONE OF THE ADVANTAGES of the American Society for Metals is that at least once a month the members get together for an exchange of ideas. A good cross section of the metals industry can be found at any meeting of the society.

I took advantage of one of these occasions to ask several well qualified men to comment on the subject of future trends and developments in the industry. Their remarks are summarized below.

*An educator.* "The supply of trained engineers has not been equal to the demand for over ten years. It is not expected that there will be any change in the situation this year. Indeed the demand of Western industries for engineering graduates is growing so fast that it is possible that they will be in even shorter supply this year. Industry can help in the solution of the problem by encouraging young men to take up the study of engineering."

*A government scientist.* "We expect that there will be a continuation of the tremendous progress recently made in three metallurgical fields. These fields are the metallurgy of titanium, the metallurgy of zirconium, and the use of liquid metals as a heat transfer medium."

*A foundryman.* "Developments in the year should find shell molding taking its rightful place in the foundry industry. This process has had a tremendous amount of promotion and publicity in the last year or two. The recognition of the merits of the process has been so enthusiastic that its limitations—and it has some serious ones—appear to have been overlooked. When the hue and cry dies down I believe it will be found that the shell process is a valuable addition to, but not a replacement for, our present molding methods."


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**FAR LEFT: Placing a bonded insert in the drag core preparatory to making a brake drum casting. The core is seen in the background.**

**LEFT: Pouring the brake drum casting after placing the insert. At this stage of the Al-Fin bonding procedure the time element is extremely critical in that uniform temperatures must be maintained.**

**RIGHT: Semi-finished, as-cast, brake drum with gates and risers attached.**

# COMBINING ADVANTAGES OF LIGHT AND HEAVY METALS...

A PATENTED process for molecular bonding of aluminum and its alloys to steel, iron, nickel or titanium, is in use by the Al-Fin division of National Steel & Shipbuilding Corp., San Diego. Nassco is one of the ten licensees of this process in the United States, developed and patented by Fairchild, and one of the two operating licensees on the Pacific Coast.

Most of the variety of projects undertaken by Nassco in its first year of having the process have been in the experimental stage, but some have developed into limited production quantities.

This casting process permits production of bi-metallic units combining the selected physical properties of both metals. Pure aluminum or any of the aluminum casting alloys can be bonded to ferrous metals or to nickel or titanium.

The process consists essentially of casting aluminum in the usual manner against an especially prepared surface of the ferrous metal. All of the standard casting methods—sand, permanent mold, plaster mold and pressure die casting—can be used.

Bonded construction facilitates the production of units combining hardness, strength and fatigue resistance of ferrous metals with the light weight, high heat conductivity, excellent bearing properties, oxidation resistance, and other characteristics of aluminum and aluminum alloys.

In molecular bonding, little special equipment or material is required beyond that of a well-equipped aluminum foundry, and only three additional operations to those in customary foundry practice are necessary.

## Costs

Cost of using this process in production normally does not greatly exceed the cost of an ordinary aluminum casting of the same size and complexity. The minor increase in cost, due to the bonding operation, is often offset partially or entirely by the fact that keyed, serrated, or knurled ferrous inserts are not necessary to obtain an inseparable joint and cost of machining or forging the inserts is reduced accordingly.

The bond is essentially a complex intermetallic compound of ferrous metal and aluminum having a mean tensile strength of 15,000 psi., and withstanding shearing stresses of 7,000 psi. The bond retains its strength at elevated temperatures of 500 deg. F., and there is no measurable drop in temperature across the interface. It is both vibration-proof and leak-proof to hot oil and gases under high pressures, and has been tested for oil-tightness up to 3,500 psi. hydraulic oil and pressure-tested at 1,000 psi. of dry nitrogen.

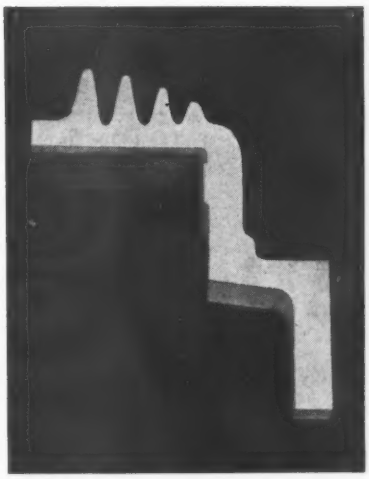
Electrolytic corrosion is not encountered in bi-metallic construction inasmuch as the intermetallic bond between cast aluminum and the ferrous component prevents any possible separation of the dissimilar metals which would allow galvanic action.

In many applications it is important that the physical properties of the steel member remain unimpaired, so Al-Fin processing requires temperature treatments high enough to partially draw low carbon steels. For more exacting requirements, use is made of the more stable alloy steels. The fatigue properties of these alloys, such as SAE 4130, 4140 and 4340, are not materially changed as determined by laboratory test. If extreme hardness is desired, the insert can be made of nitralloy and nitrided before processing. However, the area to be bonded should not be nitrided.

Steel-backed aluminum cap, slipper, thrust, and sleeve bearings and bushings offer the excellent bearing qualities of aluminum, coupled with the strength, resilience and fatigue resistance of steel. They are especially suitable for heavy-duty applications such as are found in diesel engines, but the field of usefulness seems unlimited. As

The partially finished brake drum, before final machining operation, being inspected by Foundry Manager W. O. Kelley at Nassco's Al-Fin div., San Diego.

BELOW: Cross section of the brake drum which shows cast iron ring bonded to aluminum drum.



## . . . Molecular bonding process casts aluminum against specially prepared surface of ferrous metal

a bearing material, aluminum has a low coefficient of friction, is about the most resistant of all to chemical attack by engine oils, has superior thermal characteristics, good fatigue properties, high load-carrying capacity, and satisfactory conformability and imbedability.

With steel backing to support "crush" and structural loading, it is possible to fully utilize the excellent bearing characteristics of 6% tin-aluminum without the detrimental effects of strengthening alloying elements required in solid aluminum bearings. In addition, by using lead-indium overlay the load-carrying and anti-seizure characteristics of Al-Fin bearings can be made equal to those of silver.

### Two drum types

Bonded bi-metallic brake drums are made in two general types, known as Mark I and Mark II. Mark I type consists of the basic spider and braking surface in cast iron or centrifused iron in stamped steel, with bonded-on aluminum cooling fins. The Mark II type is essentially a high-strength cast aluminum alloy structure which takes the torque load, with the braking surface of gray cast iron bonded-in. In addition to these two types of brake drums, there is a disc type with cast iron braking discs bonded into aluminum inner and outer housings against which an actuating mechanism expands the brake shoes.

The advantages of the bonded bi-metallic brake drum include marked reduction in fading, longer drum and lining life with reduced checking or crazing of the drum, and less frequent lining replacement. A secondary result of the bonded bi-metallic construction is elimination of the "squeal" experienced with ordinary cast iron brake drums, particularly on buses and trucks, because of the damping effect gained in this construction.

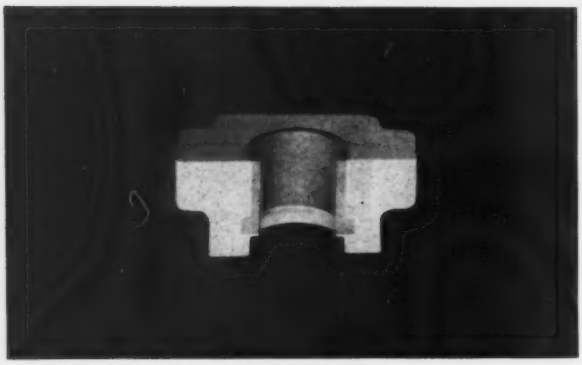
In drums of the bus and truck type, weight saving will be as high as 35%, as compared with standard cast iron drums. This weight saving can be particularly advantageous in airborne military equipment such as anti-aircraft guns, personnel carriers and howitzers.

Where steel or cast iron is subjected to an oxidizing or corroding medium, it has been found that a thin layer of bonded aluminum can protect the surface, assuring a continuous coating that will not crack or flake away under severe operating conditions.

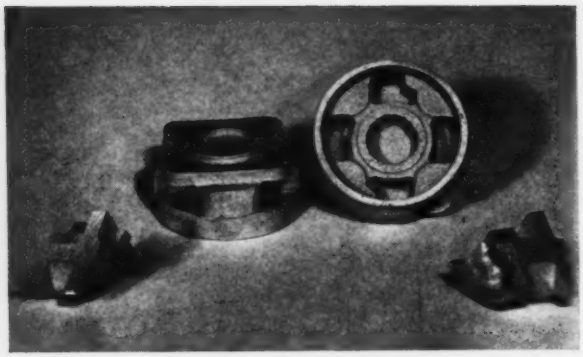
The inter-metallic compound formed in bonding is in itself corrosion resistant. In applications where temperatures about the melting point of aluminum are encountered, protection is given by this aluminum-iron compound after the outer surface of pure aluminum disappears. The inter-metallic compound formed on the surface of the ferrous part protects against oxidation at temperatures as high as those at which the base metal still has useful strength. It has proved effective at temperatures as high as 1,900 deg. F.

### Protection cuts costs

This ability to provide oxidation protection for ordinary steels or irons at elevated temperatures and in the presence of corrosive gases permits important savings in critical metals since it makes possible the use of carbon or low-alloy steels in place of stainless steels for a great number of applications without any reduction in life or strength qualities. It is particu-



Cross section of an experimental combustion chamber.



A bearing housing section for an electric motor.

larly well-suited for such parts as gas turbine combustion chambers and tail pipes.

Bonded aluminum coatings have proved outstanding where sulphur or sulphur compounds are present. In comparative tests, samples of aluminized steel were subjected to gases having a high-sulphur concentration at elevated temperatures. Results of these tests indicate that aluminum-clad components can be expected to have many times the life of untreated parts.

Cost saving applications of the bonding process have been found in many fields. A typical example is an automotive oil filter container which formerly was made by bolting a cast aluminum mounting flange to a drawn-steel canister made of 3/64-in. low-carbon steel. The separate flange had to be faced and machined. Holes for the cap screws were drilled in both cannister and flange, and, in addition, a gasket and cap screws were required. Considerable labor was further needed to assemble and pressure-test for oil leakage.

With a bonded bi-metallic unit all machining, assembling, testing, and gasket and screw costs are eliminated, and a 35% saving in aluminum results.

Considerable research has been done by National Steel & Shipbuilding in bonding applications to titanium. A coat of pure aluminum can be bonded to a titanium piece, resulting in an extremely hard bond with heat-resisting ability up to 1,800 deg. F. in some atmospheres.

### In demand

Because of increased demands by industry, particularly the aircraft industry, for titanium, rapid strides have been and are being made to develop new alloys, reduce metal processing

*Continued on page 88*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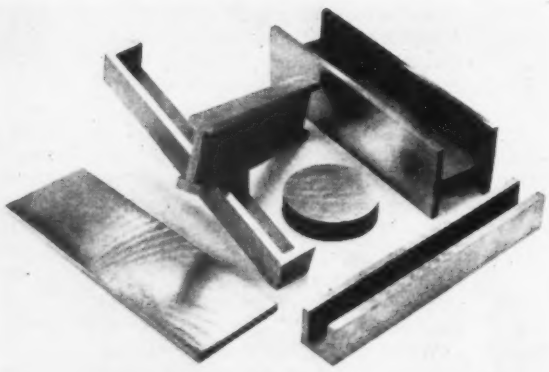

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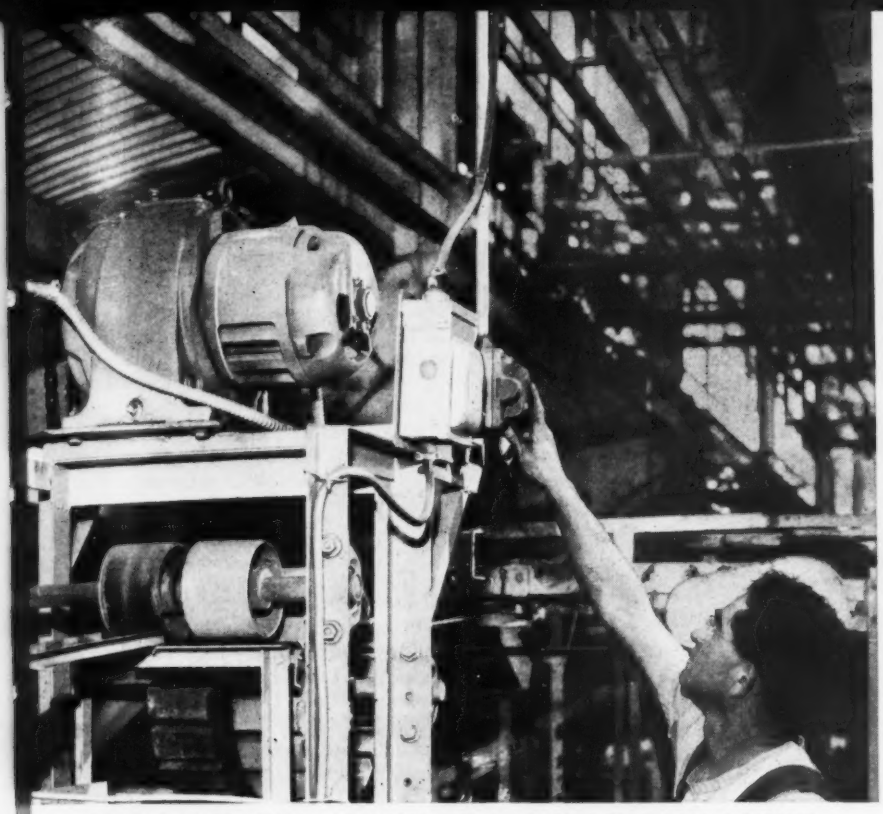

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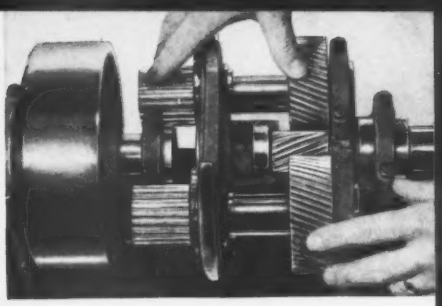

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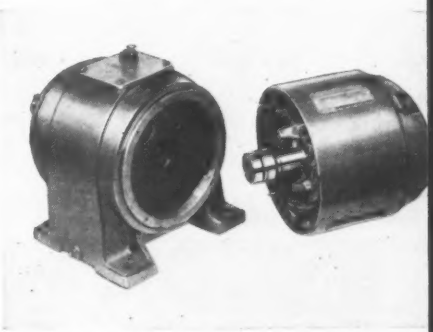


**SIMPLE CONSTRUCTION** makes it easy to remove the motor from the gear housing, and without disturbing the gear train.

## LIGHT AND HEAVY METAL

. . . Continued from page 86

costs and increase the tonnage of ingot metal. At present titanium alloys which have been bonded have very satisfactory physical characteristics.

Previously steel surfaces had to be cadmium or chrome plated before they could be joined or fastened to aluminum surfaces. Aluminum and steel can now, however, be bonded without plating, or any other protective measures.

The remarkable diversification of products on which Al-Fin bonding has been tested forecasts considerable foundry plant expansion in the near future.

Al-Fin bonded brake drums have been made in experimental quantities for a howitzer to be tested at the Rock Island, Ill., arsenal. When normal brake drums become overheated, they elongate or stretch if the rate of heat dissipation is low. The result is a loss in braking effect, or fading. Aluminum fins are cast around the cast-iron braking surface to accelerate the rate of heat dissipation and thus minimize or prevent brake failures in many cases.

Nassco also has cast bonded guided missile control surface parts for Consolidated Vultee Aircraft Corp., San Diego and Pomona, Calif., rocket parts for Aerojet Engineering Corp., Azusa, Calif., and miscellaneous structural test parts for an advanced Northrop test missile.

The company also has a limited production order from Summers Gyroscope Company, Santa Monica, for gyro parts, and for heavy-duty truck bearings for the Fobart Company, Santa Monica. Seventy-five bonded metal bearings will be tested in trucks under extreme service conditions by the Fobart organization early this year.

### To illustrate

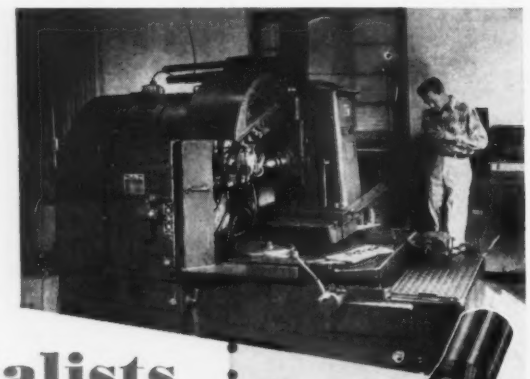
Illustrating still further the variety of uses to which the bonding process is being applied, Nassco has been making hydraulic three-stage air pump castings of revolutionary design for Research and Development Corp., Chula Vista, Calif., and bearings bonded into aluminum housings for U. S. Electric Motors, Los Angeles.

Several test parts for high-temperature combustion chambers are also being turned out for AiResearch Corp., Los Angeles, in order to reduce present machining costs on typical parts as well as to increase producibility.

Woodrow O. Kelley, manager of Nassco's foundry division, who was instrumental in having the company secure the Al-Fin license, is satisfied that experience being gained by National is laying the foundation for large-scale production, in both military and consumer goods fields.

Further development of the process on the West Coast promises further progress in search for methods to reduce weight, increase heat dissipation, produce pressure-tight aluminum castings, reduce machining costs, and solve many other design and production problems confronting the metallurgist and manufacturers.


*Gleason spiral bevel gear grinder for tolerances of .0002"/.0005", capacity of 17" diameter, 3 pitch and a 10-1 ratio.*



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ADVANCE brings you the combination of skilled mechanics and the right equipment to produce highly specialized gears of every type. Because spiral bevel gearing is so important to the operation of precision machines and equipment, ADVANCE has made it a point to offer a very specialized service in this phase of gearing. Equipment such as that shown above is available at ADVANCE. It enables us to offer a much wider range in spiral bevel gear production. It exemplifies the manner in which ADVANCE is geared to meet the needs of industry.

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*Bevel Gears*
*Spiral Bevel Gears*
*Helical Gears*
*Worm Gears*
*Gear Racks*

*Sprockets*
*Splines*
*Serrations*
*Gear Hobbing*
*Gear Shaving*
*Gear Grinding*

*Write, phone or wire for information on ADVANCE specialized facilities.*

**Advance Gear & Machine Corp.**

5851 Holmes Ave. • Los Angeles 1, Calif.


## WORKSHOPS ON communication

A 1953 SERIES of Workshops on Communication, sponsored by the Industrial Relations section of the California Institute of Technology, will be held the second Tuesday of each month from February through June. Topics to be discussed at the Workshop meetings include supervisors' manuals, employee handbooks, explanation of job evaluation and wage administration to employees, suggestion plans, and preparation of employees for retirement.

# 500% BRIGHTER ...with Alsynite

THE ORIGINAL TRANSLUCENT FIBREGLASS PANEL

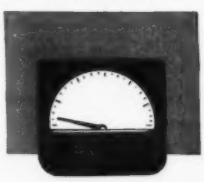
**AN ACTUAL CASE HISTORY ON FILE AT TRIANGLE STEEL & SUPPLY CO.**

**PROBLEM:** How to efficiently light tool room bins without costly electrical installations.

**SOLUTION:** First a light meter reading was made in the tool bin area under metal roofing; the meter reading was a weak 4 foot-candles.

Then two sheets of metal roofing were removed and interchanged with 2 sheets of Alsynite. The meter reading was a satisfactory 20 ft.-candles or 500% increase in natural light. Thus sufficient light was obtained for efficient clerk use without installing costly lighting equipment.

METER READING WITHOUT ALSYNITE 4 FT.-CANDLES



METER READING WITH ALSYNITE 20 FT.-CANDLES

**YOU CAN DO THE SAME** in your plant, with Alsynite, the original weather resistant, translucent fibreglass panels.

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**3. EASY WORKABILITY.** Alsynite cuts, saws, drills, or punches easily. You can nail it, cut it with tin shears, or drive screws through it.

**4. EASY INSTALLATION.** Light of weight, Alsynite requires no special framing, structure, or labor.

**5. ECONOMICAL.** Light savings, improved working conditions, ease of installation and maintenance, and long life expectancy all add up to make Alsynite just about the biggest money-saving item in the structural field.

**For complete Alsynite information phone or write**

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**TRIANGLE STEEL & SUPPLY CO.**

**3691 BANDINI BLVD., VERNON STATION, LOS ANGELES, CALIFORNIA**

## VACUUM METALLIZING for brilliant finishes

A WIDE VARIETY of metals can now be plated or metallized by high vacuum evaporation, according to National Research Corp. Commercial application of the method is new but is growing rapidly, for three reasons: (1) low processing costs, (2) brilliant finishes that can be obtained, and (3) economical consumption of critical materials.

Briefly, this is the process. Articles to be coated are placed upon suitable jigs and introduced into a bell jar or steel tank, depending upon the size of the operation. A small amount of the coating metal is placed on filaments arranged in the chamber.

The chamber is evacuated to the required degree of vacuum, and low voltage current fed to the filaments causes the coating metal to boil and vaporize. The metal vapor condenses on the articles in the chamber, producing a coating of microscopic thickness.

In about 95% of applications, the coating metal is aluminum, although practically any metal, as well as alloys, can be deposited by this method. With the usual thickness of four millionths of an inch, one pound of aluminum will cover 25,000 sq. ft. of surface.

The cathode sputtering process, frequently confused with vacuum evaporation, differs in these respects. The metal to be coated is transferred to the article by high voltage bombardment rather than by direct thermal evaporation. Equipment required is similar to the evaporation unit except that a more moderate vacuum with provision for adding an inert atmosphere is required. The sputtering process is used mainly in work with precious metals. It is not used in high production, since rates of metal transfer possible are far less than with vacuum evaporation.

## TOOL HANDLES toughened by fire

BY RUNNING top grade ash wood handles through a white-hot furnace, generating some 1,800 degrees, new strength in handles is developed. United State Steel Corp. engineers then cool the charred handle, sand it, and then after using the company's special sealer, polish it. When finished the handle gives the appearance of an ebony shaft finely grained with ivory, and it has acquired a toughness and wear resistance superior to untreated handles.

## UNIQUE MILLING machine does a precision job

MACHINING of rotor blades for a ramjet engine turbine is a precision job. The rotor blades must be cut to fine tolerances, with varying thickness in each blade, at a specified angle of pitch and twist.

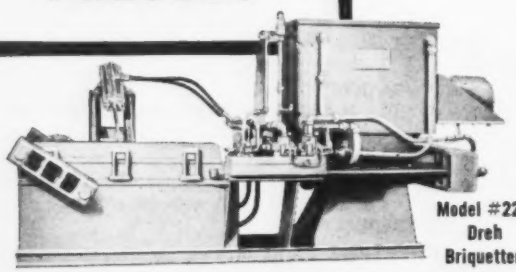
Recent problem at Marquardt Aircraft Co., Van Nuys, Calif., was to find an outside manufacturer to produce blades with required tolerances on a production schedule. Failing to find such a company, Marquardt went to work and designed their own machine.

The rotor mill designed and built by Marquardt utilizes a series of cams and a Fray all-angle cutting head turning at 1,800 rpm. Cutting operations so far have been achieved by using end mills and rotary burrs.

The rotor blades are cut from a turned blank metal piece. They are machined to a degree of precision that requires only a burring operation before final installation is made in the ramjet. Air flow surfaces of the blades are maintained to about 10 to 20 RMS finishes. The rotor cutting machine was designed, out of necessity, to save valuable production time.


**HY-CAL BALING PRESSES**

Manufactured in Los Angeles



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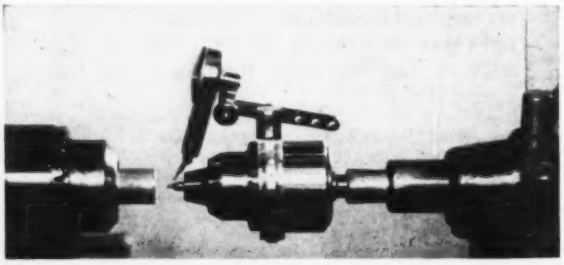
**INDICATOR HOLDER FOR CONTROLLING CENTER DEPTHS**



Picture above shows the conventional method of using the Monte Indicator Holder for controlling the depth of the center drilled hole in a shaft. Specified hole depth may be obtained by placing the drill chuck in a Vee block in an upright position and setting the indicator with a height gauge.

This same setup can also be used to control depth of holes drilled in a lathe. Degree of accuracy is determined only by the graduations of the indicator used; i.e., .0001, .0005 or .001, as the operator can easily stop on the same position of the indicator every time.

*Priced at $1.50 and Sold by*

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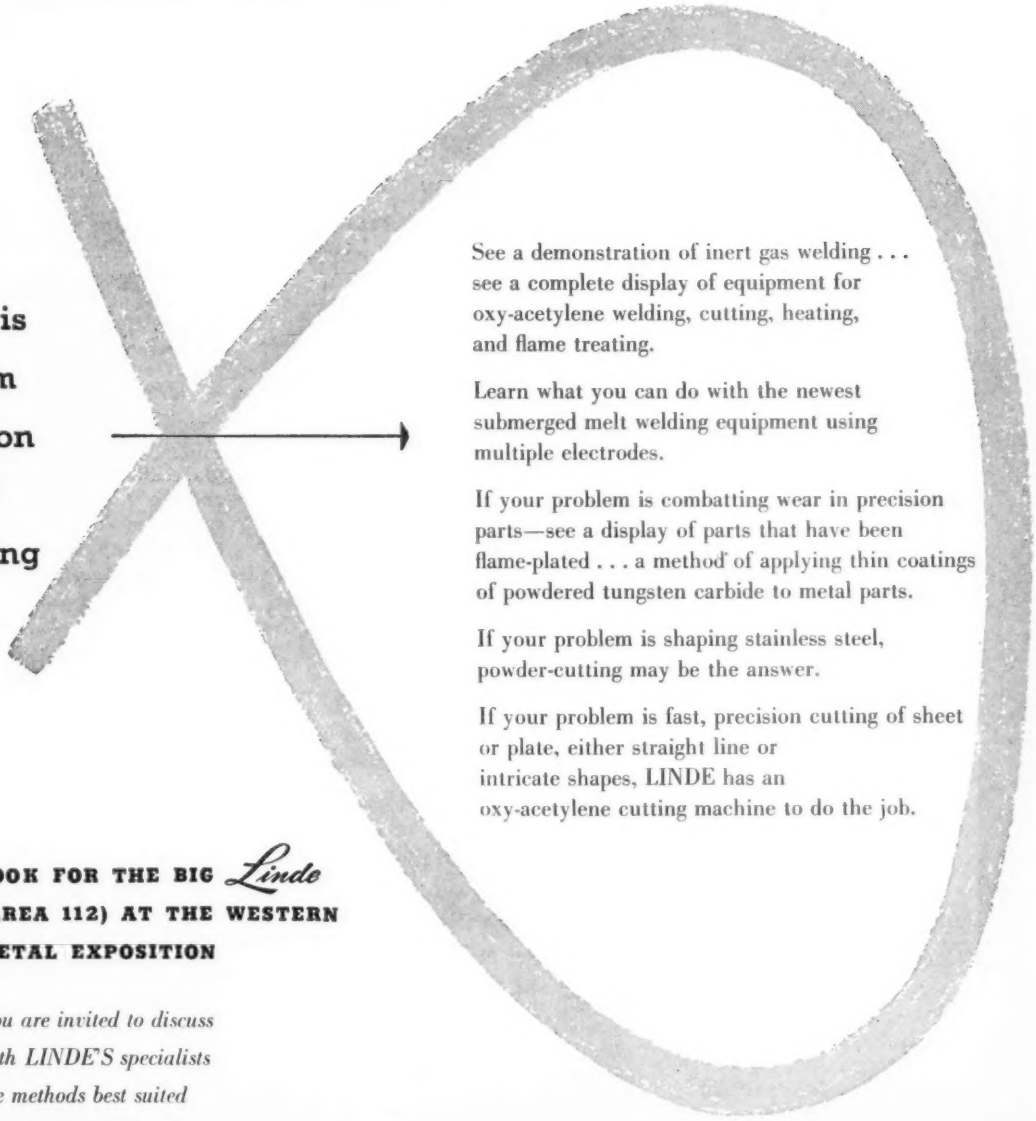
**if your problem is maximum production in metal fabricating**



See a demonstration of inert gas welding . . . see a complete display of equipment for oxy-acetylene welding, cutting, heating, and flame treating.

Learn what you can do with the newest submerged melt welding equipment using multiple electrodes.

If your problem is combatting wear in precision parts—see a display of parts that have been flame-plated . . . a method of applying thin coatings of powdered tungsten carbide to metal parts.

If your problem is shaping stainless steel, powder-cutting may be the answer.

If your problem is fast, precision cutting of sheet or plate, either straight line or intricate shapes, LINDE has an oxy-acetylene cutting machine to do the job.

**LOOK FOR THE BIG *Linde* (AREA 112) AT THE WESTERN METAL EXPOSITION**

*You are invited to discuss with LINDE'S specialists the methods best suited to your own production. It may be inert gas welding, submerged melt welding, oxy-acetylene welding. Maybe the operation should be manual or mechanized. LINDE is ready to help you work out the best solution.*

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# RESIDUAL STRESS PROS AND CONS

By Dr. Kent R. Van Horn,
*Director, Aluminum Research Laboratories, Aluminum Company of America*

*From IMD Lecture*
*American Institute of Mining and Metallurgical Engineers*
*Los Angeles, Feb. 18, 1953*

### Definition

When a metal is plastically deformed by bending, rolling, pressing, or by a phase transformation or precipitation from solid solution, or by a sharp temperature gradient resulting from non-uniform cooling, quenching or welding, it remains in a state of strain. Strains or strain gradients produced by such operations and retained after all external forces are released are known as residual strains, and the accompanying stresses as internal or residual stresses.

### Examples of sources

*Mechanical:* Cold rolling or any cold working process.

*Thermal:* In heat treating processes where a combination of compressive and tensile strengths will occur.

### Advantages that have been commercially utilized

1. Stresses produced by plastic expansion are used to increase the strength of gun barrels and pressure vessels (auto frettage). The strength of rotating wheels can also be enhanced by a previous overloading.

2. Stresses imposed by shrink fittings are also employed to increase the strength of gun barrels.

3. Stresses formed by shrink fitting or the introduction of inserts are utilized to improve the service life of extrusion cylinders, forging dies and drawing dies.

4. Stresses introduced by the quenching of most metal parts probably have a beneficial effect on the fatigue strength.

5. Stresses derived from local deformations produced by mechanical surface treatments, such as surface rolling, shot or hammer peening, ball pressing, etc., reduce to a considerable extent the injurious effect of notches, corrosion and chafing on the fatigue strength.

6. Stresses resulting from stretching, bending, twisting and overloads in various types of service applications are used to advantage.

### Principal detrimental effects

1. Warping or distortion during machining is related to the magnitude of the residual stresses, their distribution, and the quantity and location of the removed metal or the overloading of the part in the fixture.

2. Fire cracking and stress cracking may occur during the soldering and brazing of cold worked steels and copper alloys.

3. Materials quenched for the purpose of hardening, such as steels and the aluminum alloys, may crack during or after quenching.

4. Castings and ingots may crack on cooling, storing or reheating.

5. Fusion-welded structures may crack during welding or in service.

6. Certain alloys, subjected to mild corrosion, crack when sufficiently high surface tensile stresses are present.

7. Steel boilers, subjected to corrosion under stress, crack around riveted or otherwise deformed locations.

### Thermal relief

Relief of residual stress by various thermal treatments, i.e., reheating to a temperature at which sufficient plastic flow can occur, is not practical in all cases because of the sacrifice in other important engineering properties. In general, the magnitude of the residual stresses in casting alloys in tests made was lower than in forging alloys, because of the prevalence of boiling water quenching for casting alloys. Less variation was encountered among the different casting alloys than among forging alloys in commercial temper as a result.

Mechanical relief includes stretching, repeated bending and coining. There are possibilities of combining thermal and mechanical treatments.

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## WELDING CLINICS draw more than 5,000 people

AROUND 5,500 people attended a series of three welding clinics staged by the Pacific Metals Company in February in Los Angeles, Salt Lake City and San Francisco to demonstrate the latest welding techniques, equipment and materials.

Exhibitors and demonstrators were the following:

Aluminum Company of America, The American Platinum Works, Crucible Steel Company of America, The International Nickel Company, Inc., Linde Air Products Company, Lukens Steel Company, Revere Copper and Brass, Incorporated, A. O. Smith Corporation and Welding Fittings Corp.

Types of welding demonstrated were electric, oxy-acetylene, heliarc, and silver brazing. Materials welded and brazed were aluminum, brass, bronze, copper, cast iron, steel, stainless steel, monel, nickel, Inconel and clad steels.

Attendance at Los Angeles was 2,500, at Salt Lake City 900 and at San Francisco between 2,000 and 2,100.

Sixteen years ago, in 1937, Pacific Metals pioneered the idea with a clinic on a much smaller scale. Since then there have been great advances in welding. The sigma and heliarc methods have appeared on the scene, many new fluxes, and great improvements in methods existing at that time.

**VIEW of some of the booths at the San Francisco session of the Pacific Metals Company Welding Show and Clinic.**

## WATER SAVING

WHAT IS probably the first instance in the Southern California area of sinking industrial waste water underground is the program of Treesweet Products, citrus juice packer of Santa Ana. They have been granted permission by the city council to drill a 75-foot hole into which clean fresh water will be returned after being used to wash cans, not only relieving sewer lines of a tremendous load during canning season, but also adding up to 200 acre-feet to the underground supply.

## CIVIL DEFENSE

COURSES are now being offered monthly at the Western Technical Training School to instruct trainees in setting up a protection plan to prepare for natural or wartime disaster. The school, located on the campus of St. Mary's College, California, turned out approximately 1,100 trainees from the eleven Western states during its first year of operation started in Oct. 1951.

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Electrolize"

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• At standard prices.

## DECONTAMINATION of nitro-glycerin

AS SOLVENTS and liquid neutralizing agents did not prove entirely effective for decontaminating tools and equipment used in handling nitroglycerine, the Naval Ordnance Test Station at Inyokern, California, turned to controlled heating to accomplish complete vaporization and/or decomposition of the nitro-glycerine. Accidental explosion of a pocket of nitroglycerine remaining showed the need of such a step.

The problem then became one of constructing an oven to perform the following:

1. Permit heating by radiant energy, within a hermetically sealed oven, of contaminated tools. Prevent contaminated air and vapors from escaping or contacting any surface in excess of 575° F. temperature.
2. Automatically control and record oven temperatures.
3. Prevent accidental opening of oven over 130° temperature.
4. Provide visible and audio warnings of malfunction of oven and controls. Prevent temperature exceeding 575°.
5. Easy cleaning and maintenance of oven interior.

Corona Manufacturing Corporation of Glendale, Calif., designed and constructed the oven, using a Corona-Merco infra-red "Pyrex" tube which transmitted infra-red energy so efficiently that the tube remained cool and did not exceed the critical temperature of the material.

Hermetically sealing the electric wiring and the heating element from the interior of the oven was accomplished by utilizing glass-to-metal seals on the tube ends. By making hermetically tight mechanical joints between the tube ends and the oven walls, and keeping such connections sufficiently flexible, thermal expansion and contraction was possible without damage to the heaters or connections.

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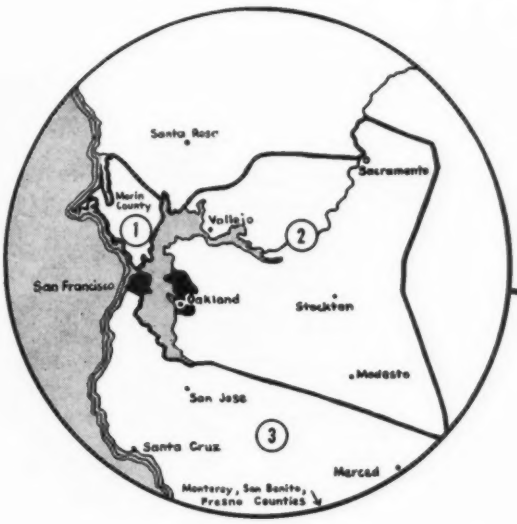

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"Tom" Thompson, Credit Manager
Wm. Wedel, Walter Dickey,
Henry Jensen, Inside Sales

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11. Clarence L. Kier
    Folsom — Box 546
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    San Diego — WOodcrest 8-2512
13. Norton Bock
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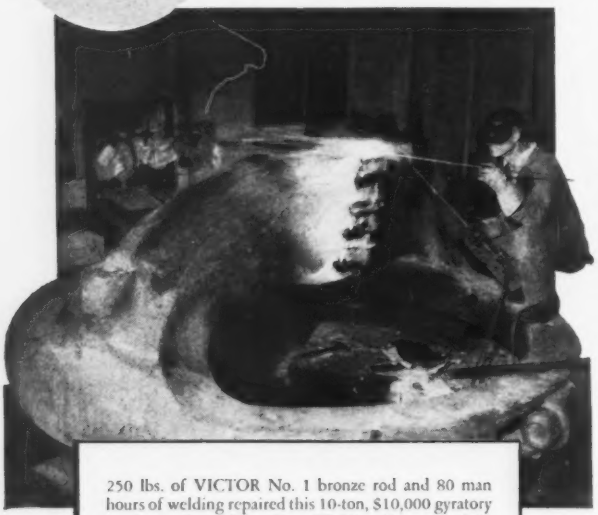
**THE MAN ON THE JOB**
*likes Victor adaptability!*



250 lbs. of VICTOR No. 1 bronze rod and 80 man hours of welding repaired this 10-ton, $10,000 gyratory crusher casting at West Coast Welding Company, Oakland, California. Job was done with VICTOR No. 310 welding torch butt with No. 320 extension and No. 10 and No. 12 Multiflame nozzles.

***Whatever the job . . . welding, cutting, heating, brazing, descaling . . . you'll start it quicker, finish it sooner with versatile VICTOR equipment.***

***Here's why:***

- HAND-TIGHT QUICK-CHANGE nozzles and cutting attachments are on or off with a twist of the wrist —no wrench needed!
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Ask him to show you why it *pays* to standardize on VICTOR.

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## QUARTERLY COST STATISTICS of gray iron foundries, third quarter, 1952

Compiled by The R. W. Paulsen Co., Davenport, Ia.

| MELT COST | Mid-west | Pacific NW | Cali-fornia | Far West |
|---|---|---|---|---|
| Pig and Metals (Alloys not inc.) | 2.75 | 2.35 | 2.65 | 2.57 |
| Labor and foreman | .33 | .53 | .52 | .52 |
| Coke | .42 | .45 | .56 | .53 |
| Supplies and expense | .15 | .16 | .25 | .22 |
| Repairs | .07 | .05 | .07 | .07 |
| Share of general overhead | .25 | .32 | .33 | .33 |
| Total melting or conversion cost | 1.22 | 1.51 | 1.73 | 1.67 |
| Total melt cost | 3.97 | 3.86 | 4.38 | 4.24 |
| **MOLD COST** | | | | |
| Mold—Direct Labor | 1.08 | 1.61 | 1.39 | 1.45 |
| Indirect Labor | 1.17 | 1.40 | 1.48 | 1.46 |
| Foreman | .19 | .27 | .16 | .19 |
| Sand supplies and expense | .39 | .48 | .57 | .54 |
| Repairs | .27 | .18 | .23 | .22 |
| Share of general overhead | 1.63 | 1.76 | 1.91 | 1.87 |
| Total mold department cost | 3.65 | 4.09 | 4.35 | 4.28 |
| % overhead on mold direct labor | 338 | 254 | 312 | 294 |
| **CORE COST** | | | | |
| Core direct labor | .47 | .68 | .80 | .77 |
| Indirect labor and foreman | .42 | .19 | .38 | .33 |
| All other overhead | 1.02 | .82 | 1.19 | 1.08 |
| % overhead on core direct labor | 309 | 148 | 195 | 183 |
| **CLEAN AND SHIP COST** | | | | |
| Labor | .80 | .95 | 1.06 | 1.03 |
| Foreman | .08 | .05 | .09 | .08 |
| Supplies and expense | .16 | .16 | .18 | .17 |
| Repairs | .11 | .07 | .10 | .09 |
| Share of general overhead | .60 | .65 | .75 | .73 |
| Total clean and ship cost | 1.75 | 1.88 | 2.18 | 2.10 |
| % overhead on mold direct labor | 162 | 116 | 156 | 144 |
| % overhead on mold and core direct labor | 113 | 82 | 99 | 94 |
| % mold and clean and ship expense on mold direct labor | 500 | 370 | 468 | 438 |
| **GRAND TOTAL COST** | | | | |
| Total cost per lb. for foundry (alloys not included) | 12.36 | 13.13 | 14.67 | 14.25 |
| Customers' returns | .26 | .04 | .28 | .21 |
| Alloys and delivery expense | .23 | .21 | .17 | .19 |
| Total cost per lb., alloys and delivery expense included | 12.85 | 13.38 | 15.12 | 14.65 |
| Lbs. per molder and prod. helper combined per day | 1,453 | 959 | 1,152 | 1,093 |
| Total all labor man hrs. per ton | 54.7 | 63.9 | 66.2 | 65.6 |
| **LOSSES** | | | | |
| (Yield good castings % of cupola charge) | (61) | (71) | (63) | (65) |
| % melt loss on purchased metal used | 10 | 11 | 11 | 11 |
| % returns from customers | 1.9 | 0.5 | 2.0 | 1.7 |
| % foundry scrap | 7.2 | 4.1 | 5.0 | 4.8 |
| (Ratio: mold direct labor to core direct labor) | (2¼:1) | (2¼:1) | (1¾:1) | (2:1) |
| **GENERAL OVERHEAD** | | | | |
| Power and light | .17 | .10 | .16 | .14 |
| Depreciation | .34 | .23 | .41 | .37 |
| RE and PP taxes | .08 | .07 | .15 | .12 |
| Fire insurance | .04 | .06 | .06 | .06 |

. . . Continued on page 98

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## QUARTERLY COST STATISTICS

. . . Continued from page 86

| GENERAL OVERHEAD | Mid-west | Pacific NW | Cali-fornia | Far West |
|---|---|---|---|---|
| General repairs | .10 | .14 | .12 | .12 |
| Payroll taxes | .12 | .22 | .24 | .24 |
| Work. comp. insurance | .10 | .08 | .18 | .16 |
| Vacations and paid holidays | .23 | .29 | .27 | .28 |
| General founrdy labor | .24 | .35 | .35 | .35 |
| All other fdry expense, inc. heat | .47 | .26 | .49 | .42 |
| General supervision | .13 | .03 | .12 | .10 |
| All selling and admin. expense | 1.03 | 1.42 | 1.15 | 1.22 |
| Total of all general overhead | 3.05 | 3.25 | 3.70 | 3.58 |
| **SUMMARY** | | | | |
| Pig and metals (alloys not inc.) | 2.75 | 2.35 | 2.65 | 2.57 |
| All labor and supervision | 4.91 | 6.06 | 6.35 | 6.28 |
| All other expense | 4.70 | 4.72 | 5.67 | 5.40 |
| Total cost per lb. | 12.36 | 13.13 | 14.67 | 14.25 |
| % of total molder capacity | 60 | 59 | 67 | 64 |
| % of max. com. demand | 67 | 103 | 74 | 81 |
| Average hourly earnings except overtime premium | 1.693 | 1.824 | 1.799 | 1.806 |

| Foundries in cost group (3rd quarter '52) | Total lbs. produced | Average lbs. produced |
|---|---|---|
| Northwest | 7,447,683 | 677,062 |
| California | 20,432,428 | 972,973 |

## COLUMBIA BASIN sprinkler systems

APPROXIMATELY 25% or 125,000 acres of Columbia Basin project land can best be irrigated by the use of sprinkler systems, according to Milo W. Hoisveen, U. S. Bureau of Reclamation, speaking at Pacific Northwest American Society of Agricultural Engineers meeting in Corvallis, Oregon.

Forty-two settlers using sprinkler systems were contacted and it was found that half of their sprinklers were inadequate to meet soil and crop requirements. In some instances the systems were designed for Pacific Coast conditions and were far from adequate for the Columbia basin, and implications were that the sprinklers were designed to meet the pocketbook of the farmer rather than his crop and soil needs. This faulty design has hurt the sprinkler industry in an otherwise attractive field.

Wind has a considerable influence on spotted crop conditions resulting from sprinkler-irrigated fields. Two previous recommendations were to increase pressure and to break up the sprinkler pattern through use of a 30-ft. offset section, used with a 90-deg. elbow to permit the operator to place the lateral at a different location every other set. Both practices are being recommended for use by Columbia Basin settlers.

## FRUIT PACKERS look to foreign markets

DRIED FRUIT PACKERS and growers are spurring themselves on sales-wise, and industry-wide advertising campaigns on prunes and raisins are under way.

As the foreign aid programs which provided a good export business for the California dried fruit industry are likely to come to an end, the Dried Fruit Export Association of California has been revived. This indicates that the packers will be actively merchandising their products in foreign markets, which in prewar years absorbed such a large part of the dried fruit output.

## ALUMINUM WELDING process opens up farm tubing market

THE ALUMINUM industry is ready to satisfy the demands of Western agriculture for larger sizes of irrigation tubing, according to Dr. Dana W. Smith, metallurgical research expert for Kaiser Aluminum and Chemical Corp. at Spokane. Speaking in Oakland before the Golden Gate Chapter of the American Society for Metals, Smith described the new Yoder welded tubing process as the open-sesame for economical production of bigger tubing.

Extrusion, currently the method of manufacture for aluminum tubing, is inexpensive for small diameters but impractical for medium and large diameters. The Yoder process involves induction welding in the presence of inert gases (i.e., helium and argon) right in the rolling mill. Costs are reasonable for large diameter pipe of required quality.

Smith also described how a problem has been solved for casting billets for the giant presses used in military forging. Castings have been limited to an 18-in. maximum; porosity and cracks developed in any larger size. By a recently developed method, aluminum is poured continuously, chilled by jets of water from the outside, and lowered as it cools into the bottom of the casting. This direct chill process makes it possible to produce a good quality large size casting.

## INDUSTRY USES atomic detective

X-RAY DIFFRACTION is increasingly being used by industry to save human lives and reap industrial profit. James P. Blackledge, head of metallurgy division of Denver University, Denver Research Institute, points out that many uses are being found for the technique by businessmen, engineers and scientists in the Rocky Mountain region. The technique allows identification of individual basic components, pharmaceuticals, chemicals, and many other items.

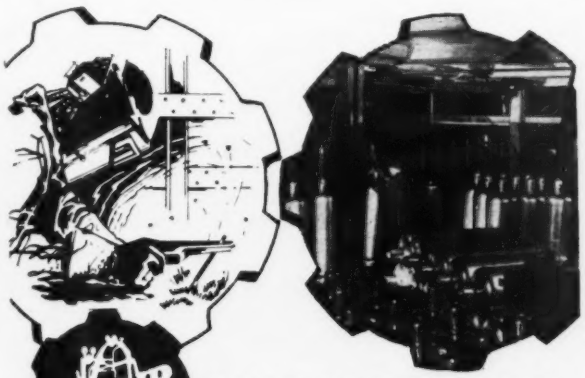
Dependent upon ultimate crystalline structures are such things as stretching quality of rubber, lubrication properties of petroleum products, strength of steel girders, and innumerable other practical applications. The "detective" has been used to identify rare chemicals and gases in ash coming from smokestacks, and could be used to analyze soils or identify harmful elements in the air. This technique is taking on additional importance in the field of crime investigation.

## GAIN IN POWER predicted for West

A FORECAST that both California and Texas will eventually pass New York in population and wealth has been made by Gen. Robert E. Wood, chairman of Sears, Roebuck & Co. He also predicted that decentralization of industry will continue, and that political and economic power will pass from the Atlantic seaboard to the South, Middle West, and Pacific Coast in the next 25 years. He said no single factor affects the economy more profoundly than population growth and related vital statistics. The country's population increase has averaged 2,500,000 annually in the last three years, and growth should continue at this rate until 1960.

## IRON AND STEEL CASTINGS

FERROUS castings shipments for 1950 were 269,787 tons for the Mountain states and 483,891 tons for Pacific Coast states.

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**Convair operator holds in her hands a female over-pressing die (above) and a wrinkle-free part made with die (below). Form block that serves as mate to female die is below the part. Other items on the table are over-pressing tools and parts.**

## *Convair develops new method of*

# RUBBER HYDRO-PRESS FORMING

RUBBER HYDRO-PRESS forming methods used by North American Aircraft were described in the Metals Number of *Western Industry* last year. Consolidated Vultee at San Diego now has developed an "overpressing" method of hydro-press forming which is currently attracting considerable attention among manufacturers of sheet metal products.

### Variation on a theme

It is a variation of the original so-called Guerin process developed at the Douglas Santa Monica plant in wartime, which permitted the effective use of mass-production press equipment in the manufacture of limited quantities of stampings, but did not completely eliminate the need for manual craftsmanship. Advantages claimed for the Consolidated method are that it requires no substantial increase in basic tooling costs, permits the production of wrinkle-free parts and is adaptable to virtually all of the products that can be Guerin-processed.

It involves the use of an inexpensive "female die" to equalize the pressures applied to a sheet metal blank on a conventional form block by means of a rubber blanket. This female die is made by:

(1) Using the original Guerin process to pressform a steel sheet to the contours of a form block. The steel sheet comprises a heavier gauge of metal than the parts that will later be fabricated on the form block.

(2) Dewrinkling the sheet steel component in a conventional manner.

(3) Tackwelding steel reinforcements to those areas of the sheet steel die which are most likely to be damaged by subsequent forming pressures.

(4) Trimming and deburring the die in a conventional manner.

Female dies thus produced have an average cost of only $4, and this is usually amortized by reduced labor costs in the process of fabricating less than 10 sheet metal parts.

Lubricants are applied to sheet metal blanks prior to each production operation, so that the press-formed parts will not be scratched or excessively work-hardened by friction.

Locator pins on the form blocks and matching tooling holes in blanks and female dies make it possible to align the blanks between the form blocks and dies so that no damage will be caused by slippage during forming operations.

### Quantities

The number of parts that can be simultaneously fabricated by means of the overpressing technique during any given press operation, of course, depends on the dimensions of the parts and the bed area of the press.

Because the shortest aircraft production runs require the duplication of ten or more parts, overpressing is both economically and physically adapted to all limited production operations that would normally indicate the use of the Guerin process.

Where as few as 20 duplicate parts have been overpressed, the overall cost of Guerin processing has been reduced by margins exceeding 50%.

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## HOW TO SOLVE your cleaning problems

WITH THE INCREASE in cost concerned with cleaning an office building, the office managers have found that all increases could not be passed along to the tenants. Alfred I. Stuart and Associates, Inc., of Portland have found a sure way to reduce cleaning costs by as much as 25%.

They made a study to determine if there was a net saving in using trained workers who could cover more area and yet maintain quality. As a result of the study, they adopted new methods by which they were able to improve the quality of cleaning certain items such as floors, desks, and file cases, as well as getting the dust off out-of-the-way items which often accumulated for weeks. Average increase in area cleaned per janitress was 31%, with individual increases ranging from 20% to 40%.

The study was divided into five main steps. They are analyzing old methods, testing out new methods, retraining the janitress, counting office furniture, by suite, in the entire building, and cutting the cleaning crew and the reassignment of work.

In order to ferret out the best methods of cleaning office furniture, equipment was thoroughly scrutinized. Damp sweeping was found to be efficient, done by placing a slightly damp cloth over the brush head. When the cloth is soiled a clean one is put on. Damp dusting was also utilized. Old and unnecessary tools were eliminated, such as tooth brushes, shoe brushes, combs, etc.

Cleaning schedules were set up to determine how often various pieces should be cleaned. It was found that vertical surfaces need be cleaned only once a week while horizontal surfaces and floors should be cleaned daily. The methods and motions of the jobs were examined and the jobs divided up so as to be more easily done with less walking and other exertion. Training the crew, beginning with the foreman was the most difficult part of the job. The foreman is liaison between crews and management and must be familiar with and sold on the new methods. Training films were found to be very effective in instructing employees.

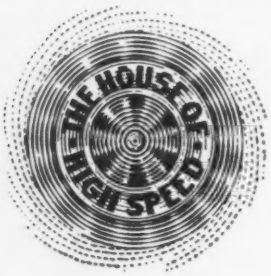
With the cutting down of the crews after reassigning work, agreements were made with the unions whereby the surplus employees would be absorbed in other capacities, or used as replacements in a natural turnover.

## TRUCK MAINTENANCE the safe, modern way

IF YOU'D LIKE to get some new ideas on overhauling and maintaining truck fleets, a good place to go would be Asbury Transportation System's just-completed terminal at Los Angeles.

Complete overhaul and maintenance equipment is on hand to service 14 trucks simultaneously. In an area 80 ft. by 260 ft., the maintenance building includes a complete machine shop with engine dynamometer, body shop, tire shop and two steam cleaners. Pits have been done away with to eliminate fire and accident hazards. All tools and lubrication equipment are portable so that different kinds of work can be done on the same equipment at the same time. Forklifts are used for handling engines and other heavy parts.

Another feature of Asbury's new 9-acre terminal is a 250-ft. by 60-ft. dock designed to promote easy handling of large volumes of freight. The dock has 24 loading and unloading bays, with adequate space for the use of fork-lift trucks in addition to an overhead crane for heavy machinery handling. Centralized at the new plant will be all Los Angeles terminal operations.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## PUNCH PRESS DIES cut costs for Northrop

A NEW and better way of making a single type of part has already contributed to considerable savings for Northrop Aircraft, Inc., in production costs. The savings were obtained by the development of cam action punch press dies to form stainless steel ends for hot air ducts used in the firm's Scorpion F-89.

These rings, made of #321 and #347 stainless steel, vary from one inch to 5¼ inches in diameter. Because close tolerances are necessary, the accepted production method was to machine them from heavy-wall tubing stock. Use of punch press forming in lieu of machining for these parts has resulted in a reduction of fabrication time from three hours to five minutes.

By the new method, the cam action dies form the parts on a punch press from .035 wall tubing up to 2.00 diameter, and from .035 strip stock welded into sleeves up to 5.25 diameter. The strip stock is rolled into a sleeve and welded on a steel mandrel. A copper insert prevents the weld from sticking to the mandrel. A special clamp holds the strip stock to the mandrel completely around the periphery except at the weld area. After Heliarc welding, the sleeve is forced from the mandrel, which has sized it within plus .005 minus .003 diameter tolerance.

Each set of dies for the various diameter parts was developed to use the same width sleeves, so that one strip stock could be used for all sleeve diameters.

Major credit for the new tooling technique goes to Edwin A. DeVoss, Northrop tooling engineer.

## X-RAYS SERVE shipbuilders

WELDING FLAWS on ship's high pressure steam lines, at certain hull stress points, and on submarine pressure hulls, will become less of a hazard to personnel as a result of new industrial X-ray techniques now available to the shipbuilding industry.

The U. S. Navy, to insure pressure hull welds strong enough to withstand the tremendous strain of depth charges, demands that all such welding jobs be checked 100% before these craft can go to sea. At three naval shipyards including the one in San Francisco, the intricate job of locating minute imperfections in "confined" areas of a ship's structure has been simplified through the use of a new industrial X-ray unit developed by the General Electric Co.

This new unit does a job in three and one-half minutes that used to take four hours with heavier X-ray equipment or radium pills. Since the X-ray head of this midget-type machine weighs less than 150 lbs., as against 1,150 lbs. for conventional units, it can be brought to the welded structure instead of bringing the structure to the X-ray machine.

The unit is portable, being mounted on a trailer which can be moved throughout the shop and waterfront areas. To get the unit inside of any ship requiring X-ray inspection, it is hoisted by traveling dockside cranes. Its small size and portability make possible the taking of "inside out" pictures, since the head of the unit can be placed in the structure to be X-rayed. The machine is capable of X-raying up to 3½ inches of steel and can operate in a range of 75,000 to 250,000 volts.

The unit is being used in the yard to inspect castings, such as valves, and high pressure piping, allowing great economy in the utilization of laboratory manpower. The unit, now available for commercial use, can also be used in foundries, welding shops, and construction projects.

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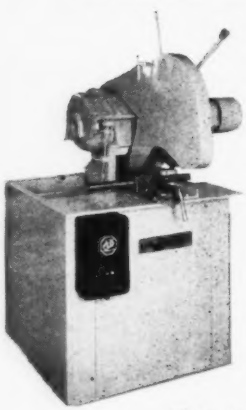

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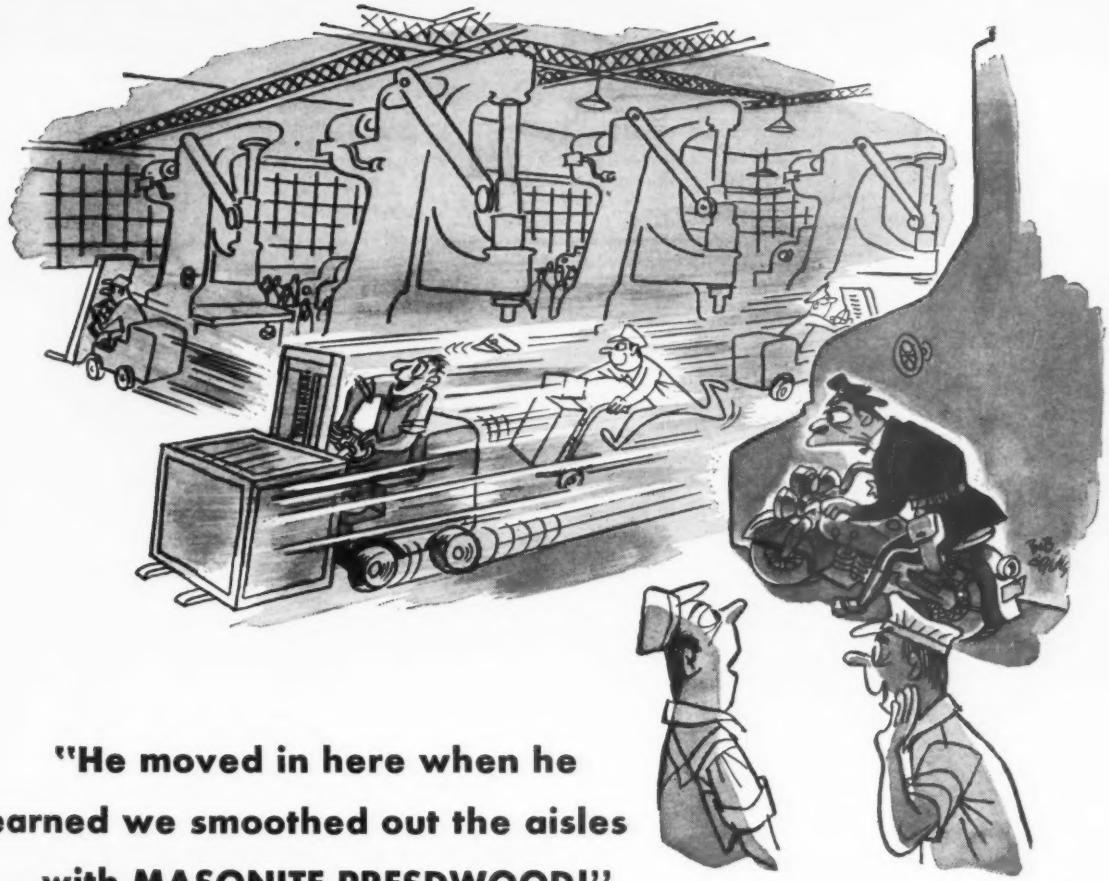

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# MICA DEMAND reopens Idaho mine

DEMAND for mica for insulating purposes in electronic and electrical instruments used by the armed services is largely responsible for the reopening of a large open-pit mine near Deary, Idaho, by the Idaho Beryllium and Mica Corp. Operations are on a three-shift basis for eight months in the year. The mine is the largest producer in the West, and one of the largest in the country.

### Production and uses

Scraps of the mica are ground into flour mica, which will be available to Western industry in the production of tires, paints, plastics, wallpaper and for finishing buildings.

At the mine, blocks are loosened by systematic drilling and blasting, picked over by hand, stored in sacks and sent to the stockpile at Deary. Here the "book" mica, as it is called, is trimmed for shipment to the General Services Administration mica supply depot at Custer, South Dakota.

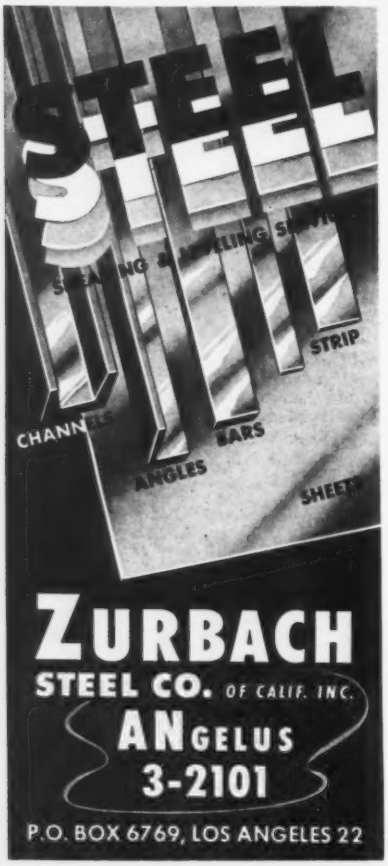
The trimming occupies from 50 to 60 women, who take the foot-thick "books" and rift off hundreds of sheets of the transparent material. Approximately one ton of book mica must be brought from the mine for every 100 pounds of trimmed mica shipped. Present production figures are classified, but the mine turned out 85,660 pounds of sheet mica for the war effort from October 1943 to May 1945.

Waste materials, or sheet mica less than one square inch in area, is called "punch" mica, used for insulating radio tube bases and other connections requiring small but clear usable wafers. Other small particles of mica containing sand or other foreign matter are called "roofing" mica, used in the manufacture of asphalt shingles to prevent their sticking together.

**IN HIS RIGHT HAND,** Resident Engineer Albert K. Smith is holding a good-sized crystal of beryl ore. In his left, several extra large sheets of mica, such as are shipped to the government supply depot.

**OPENED "BOOK" of mica is not actually black, as it appears to be here, but is really amber in color.**

Beryl ore, found along with the mica, also is being collected. This ore assays 10 to 14 per cent beryllium oxide and is earmarked for defense production. Orville Slette, manager of the trimming plant, estimates that the present sheet mica output will continue for at least three years.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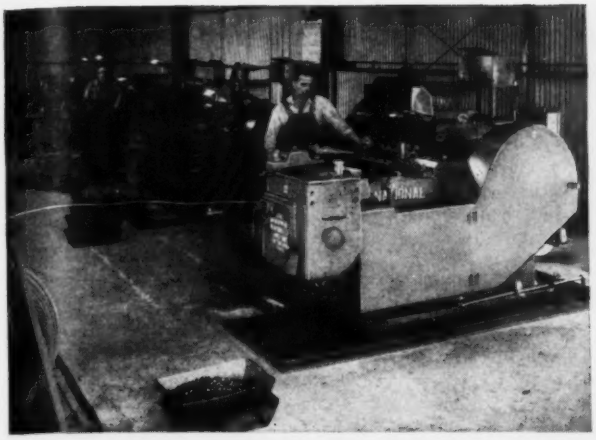
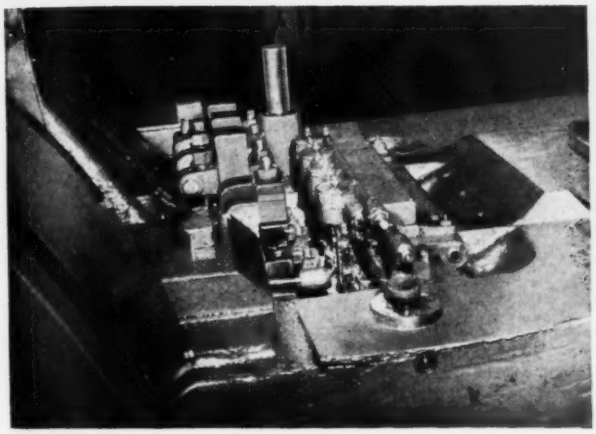




# RB&W Pioneers West Coast Nut Manufacture

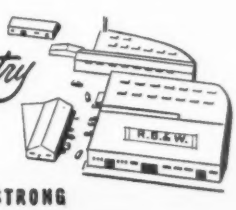
## *will serve the industry of seven western states*

RB&W is now producing semi-finished hex nuts in ten sizes from 1/4 in. to 9/16 in. at Los Angeles. This is the first operation of its kind on the West Coast and part of the over-all RB&W plan to bring the supply of basic materials closer to consumers.

An investment of a quarter of a million dollars was required to add four nut formers, ten precision tappers, and related equipment to our production facilities at Los Angeles. This plant already has a capacity of 1500 tons of fasteners per month, in 7000 different types and sizes ranging from a #4 screw to a 1 x 8 bolt.

This expansion of RB&W's operations reflects the dynamic growth of industry in the far west. Los Angeles county alone has some 12000 factories, the third highest number of any county in the nation. To better serve this flourishing industry, RB&W is pioneering this new development in fastener production on the West Coast.

**RB&W** *serves Western industry with the complete quality line*




**WEST COAST PLANT:** 4466 Worth St., Los Angeles, Calif. Other plants: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill. Additional sales offices: San Francisco, Dallas, Chicago, Detroit, Pittsburgh, Philadelphia. Sales agents: Portland, Seattle. Distributors from coast to coast.

2-38

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Lathe tool holders, wrenches and clamps

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## METALLIZING aids reclamation

THE USE of metallizing processes has been taken advantage of extensively in the Santa Fe's shop locomotive department at San Bernardino, California. Many of the component parts used currently in making repairs to locomotives are being considered for reclamation, utilizing this welding technique.

In each instance where reclamation is to be considered, a time study is made of several of the parts as they pass through the shop for reclamation. A detailed record is kept in each instance, covering labor and materials used. A study is made of this data to determine whether it would be economical to carry on reclamation.

An example of the utilization of the metallizing technique in reclamation is the restoration of ends of axles to specific tolerances at the journal ends where inner races of journal box roller bearing sleeve applications are made.

In many instances the necessity of machining operations and installation of oversize parts has been avoided through the use of some specially designed repair part. For example, Heli-Coil inserts have been used in larger diameter tapped holes when the threads have been stripped or have become worn. Of particular interest is the welding of all of the machined surfaces of traction motor main frames which are then stress-relieved and re-machined to the original dimensions.

## WESTERN FURNITURE outlook bright

CALIFORNIA designs in furniture are being rapidly accepted, and better materials are providing the best values homemakers ever had. A great many more manufacturers today are using services of designers than ever before. These were some of the important points brought out by a panel of speakers at the Los Angeles furniture market in January.

"It is to the credit of the Southern California manufacturer that he has recognized and had faith in good design, for it is this good design that has been the answer in meeting competition from other sections of the country," said Milo Baughnman, Los Angeles designer. This design supplies a new type of merchandise consumers desire and gives stores a good reason for buying in California.

*We can take care of all your forging needs— big or little...*
**CALL US NOW!**

*It pays to buy...*
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to study, test and make sure you get the right type of forging, steel and grain structure for your job.

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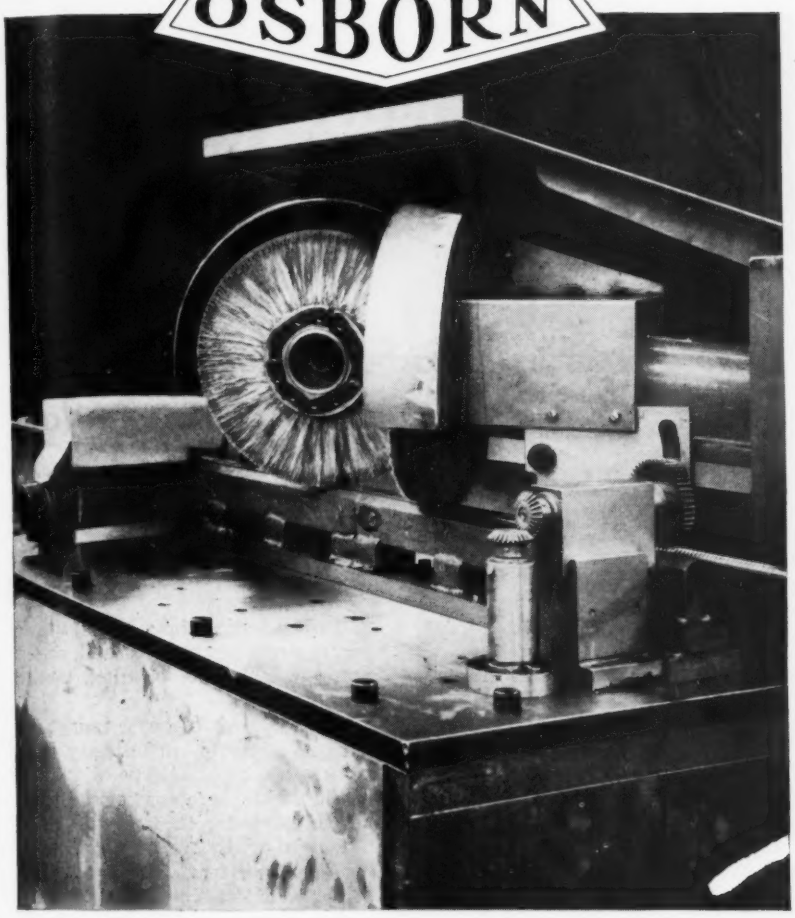


## Formerly 50 minutes...
## Now brush-deburred in 6 minutes

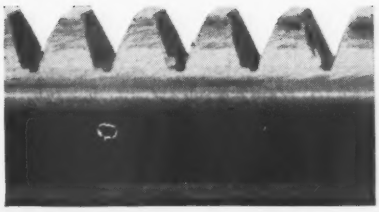
*8 times* as fast... more uniform deburring... finer surface finish. These are the advantages gained by a large machinery manufacturer with an automatic power-brushing method. The part: a rack gear, 17 ft. long with more than 1000 teeth. The job: light deburring of machine-cut teeth, and blending the junctures of intersecting surfaces to form smooth curves in place of fragile, sharp edges.

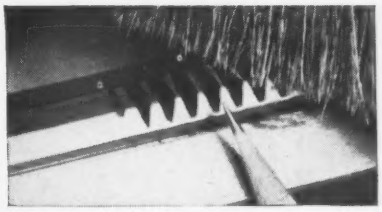
With the help of their **O**sborn **B**rushing **A**nalyst, they devised the machine shown above. This automatically controlled machine with two heads of Osborn Fascut® brushes does the entire job in 6 minutes. Burr removal and surface juncture blend are far superior to former methods.

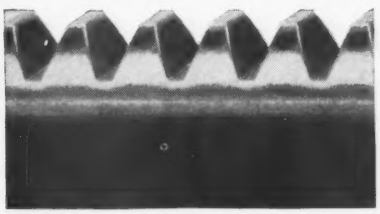
This is typical of thousands of cases where production is being vastly improved with Osborn power brushing methods. Find out how you can cut *your* costs! Call in your **OBA** today or write *The Osborn Manufacturing Company, Dept. Q-2, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

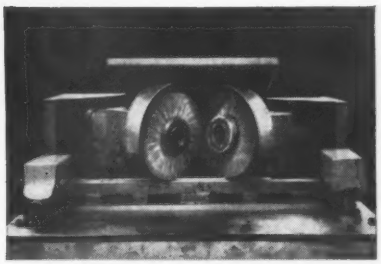
**OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES**







**BEFORE AND AFTER.** Top view shows closeup of rack teeth with light burrs and rough surface before brushing by new "push-button" method. Center view shows closeup of rack in machine after completion of brushing. Bottom view shows teeth after brushing. Note uniform surfaces and smooth finish on all teeth.



**HOW IT'S DONE.** Two rotating Osborn power brushes, engage rack teeth at angles as shown. At push of button, rack drives through machine at about 5 ft. per minute. When the rack completes passage, the drive reverses and sends it back in the other direction. On return travel of part, the direction of brush rotation is reversed to contact surfaces on the opposite side of rack. This gives both sides of teeth uniform brushing.

**WHAT'S YOUR PROBLEM?** The nearby Osborn Brushing Analyst is experienced in working with machine designers and methods engineers to solve problems with the latest power brushing techniques. Feel free to call him for help!

# HOW TO HANDLE ACIDS SAFELY

*Avoid hazards to carboys. Require employees to wear safety apparel. Take similar precautions with steel drums and tank cars*

AS FAR AS USERS of commercial acids are concerned, safety in handling starts when the acid has been received (usually in carboys or glass containers, drums, tank cars or tank trucks) and must be transferred to storage units.

It goes without saying that acids received in any of these forms should only be handled by men thoroughly instructed in the necessary precautions and adequately protected by goggles, rubber boots and gloves.

If an accident should happen, and acid is spilled on any part of the body or the floor or nearby equipment, it should be immediately washed off with large volumes of clean water. Safety showers for all year service should be conveniently located for this purpose. If an excessive amount of acid is spilled in the area, it may be necessary to use a fire hose to wash it away.

### Carboys

Carboys are safe and adequate containers when properly handled and maintained. Neglect of precautions, however, may create conditions which are hazardous to persons and property. The carboy bottles will break if handled roughly or dropped, of course, and freezing of contents may also result in breakage. If wire cutters are used carelessly when removing tie wires, breakage may also occur. The development of excessive internal pressure may also fracture bottles.

### Equipment and handling of carboys

Men who handle filled and empty boxed carboys should wear tight-fitting goggles, rubber boots, aprons and gloves of rubber or acid-resistant materials. All carboys when received should be carefully inspected and damaged ones set aside for special handling. Closures should be securely fastened before moving filled carboys, and the bottles should never be handled by the neck or closure.

**Here are samples of different types of containers for transporting and storing acids. Concrete floors treated with sodium silicate are recommended for storage of filled boxed carboys. Outside storage should be avoided if possible. Otherwise, whenever necessary, pile on dunnage on a properly drained site.**

Carboys should not be handled with hooks, nor "walked" on bottom edges, as this practice creates severe strain on the container and may cause breakage. Completely drain carboy before returning. When removing empty boxed carboys from pile, truck, or car, and when piling empty carboys, safe practice requires that the neck of the bottle should never be tilted toward a workman.

Filled boxed carboys cannot be handled safely on an ordinary hand truck. An acceptable type of truck is one in which the prongs of the truck are thrust under the carrying cleats of the carboy. By bearing down on the handles of the truck, the carboy may be moved as desired without its being touched in any way by the employee. It can be placed without jolt or jar. The employee is well out of danger, the carboy can only drop an inch or two, the truck can be easily and efficiently operated by one man.

Wood pallets, when used to handle filled and empty boxed carboys, have proven to be successful and are recommended if especially designed for this service.

### Storage of filled boxed carboys

Concrete floors treated with sodium silicate are recommended for storage. Drainage should be provided to take care of possible breakage. Filled (and empty) boxed carboys should be stored under cover, for outside storage causes rapid deterioration of the boxes and cushioning material.

If outside storage cannot be avoided, boxed carboys should be kept off the ground by placing the bottom tier on suitable dunnage on a properly drained site. Filled boxed carboys of nitric acid should not be tiered more than two carboys high; all others not more than three high.

The special precautions listed on carboy labels should always be ob-

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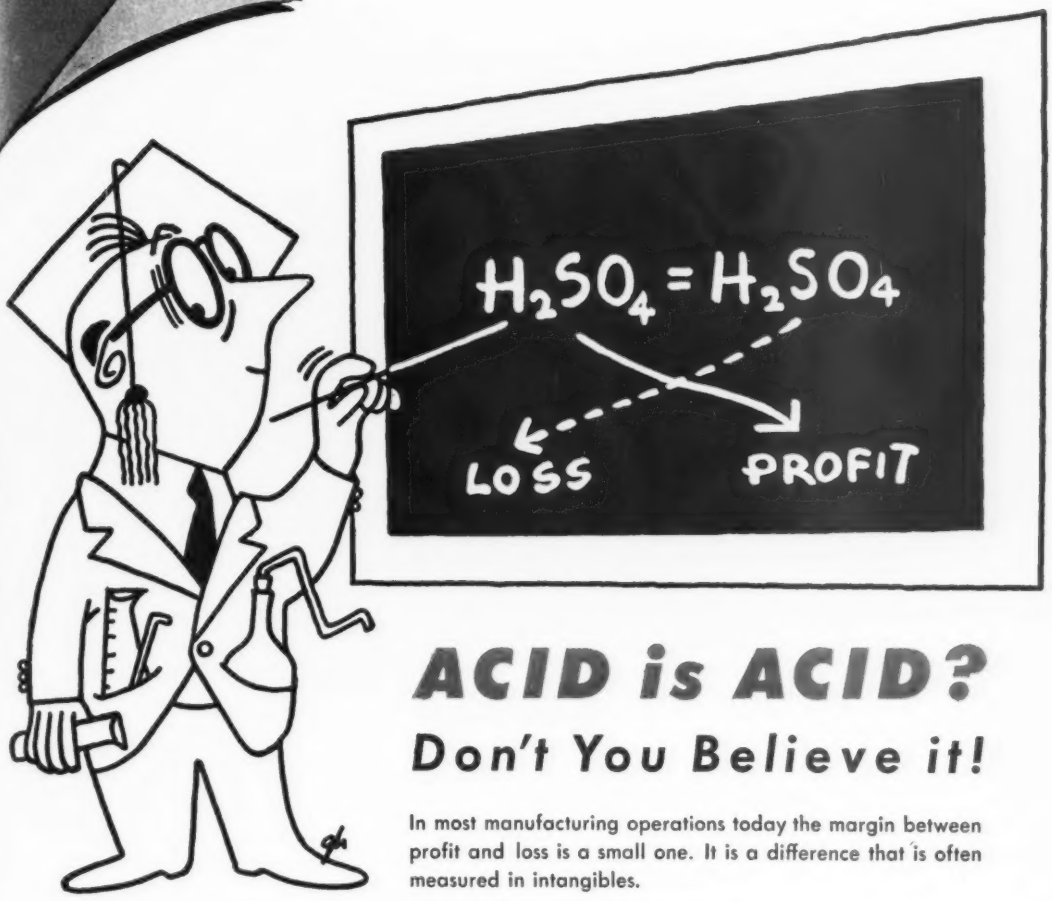
**EDITOR'S NOTE: The foregoing information was made available to Western Industry by Stauffer Chemical Company, San Francisco, from material prepared by the Manufacturing Chemists Association and other sources.**

Stauffer CHEMICALS SINCE 1885

*Lessons in Chemical Economics—NUMBER 1*




# ACID is ACID?

## *Don't You Believe it!*

In most manufacturing operations today the margin between profit and loss is a small one. It is a difference that is often measured in intangibles.

Take acids for example: Manufacturing operations demand standard specifications, constant quality in the acids used. But from a profit standpoint, those same operations demand much more—guaranteed delivery, delivery in the most economical containers for efficient handling, bulk deliveries—where and when they are needed. These are the extra things that can make the difference between operating in the black . . . or in the red.

There's a moral to this story. For industrial chemicals call on the Stauffer Chemical Company... a company that is geared for ***service*** on the local level, that can contribute to your profit picture by generously supplying the intangibles that make the difference!

## STAUFFER CHEMICAL COMPANY

**SALES OFFICES:** SAN FRANCISCO • NORTH PORTLAND, OREGON
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served. For instance, carboys containing sulfuric acid should not be stored where the temperature may drop below the freezing point, as freezing may break the bottle. To prevent freezing of acetic acid, it should be stored at a temperature above 63° F. All strengths above 80% have high freezing points and should be stored in a warm place, again to prevent breakage.

### Emptying

Carboys should be completely emptied, using gravity methods of either inclinator or siphon. Carboys must not be discharged by air pressure. In using a siphon, caution should be exercised in inserting it to prevent breakage of the bottle. Again, workmen should be completely protected by goggles, rubber boots, gloves and aprons.

### Steel drums

Safety measures when dealing with drums are essentially the same as with other acid containers. No naked flame of any kind should even be permitted to contact full or empty drums for any purpose whatsoever. Drums should never be struck with a tool or other hard object to loosen plugs, as resulting sparks may ignite inflammable gas or vapor in the drum.

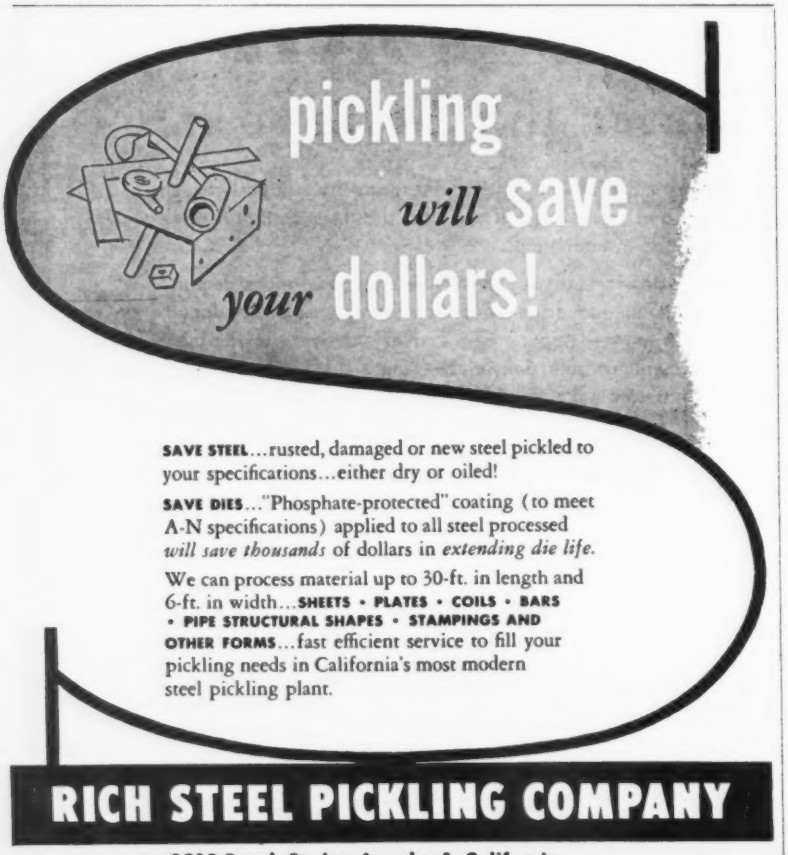
### Handling

Full and empty drums should be handled only by workmen wearing goggles, rubber boots, rubber gloves and aprons. When removing body plug, a pipe wrench or long-handled plug wrench should be used, the workman always facing away during the procedure. Body plugs on full drums should be loosened often, particularly during hot weather, to relieve possible internal pressure, then tightened again.

### Storing, emptying and closing

Drums should not be stored any longer than necessary. They should be kept out of direct sunlight or heat to avoid expansion. Always store full drums with body plug upward.

Drums should be emptied by gravity only. Application of pressure for this purpose is extremely dangerous and may result in bursting of the drum. After the acid has been emptied, the drum should be completely drained and plugs securely replaced. Do not place any other substance in the drum after emptying, and the drum interiors should *never* be washed. When drums are empty, wipe off any outside spillage and flush the outside well with water, and return the empty drum as soon as possible to the consignor.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### Tank cars and tank trucks

Most of the precautions pertaining to drums and carboys also apply to tank cars and tank trucks. Water in ample quantity must be immediately available at the unloading rack to wash off workmen or tank car or tank truck in case of spillage. Naked lights, flames, or sparks may cause serious explosion.

It should be noted here also that there may be variation between tank car or tank truck delivery arrangements or facilities of the two parties, so the customer should consult the supplier as to detailed arrangements for receiving acid by this method of shipment.

### Unloading, equipment and handling

When unloading tank car or tank truck, the air vent should be removed first before loosening discharge cap, and after emptying, the discharge connections should be disconnected immediately and the tank car fittings replaced. Under no conditions should over 30 lbs. pressure be used to unload tank car or tank truck.

A blow-off valve on air line at tank car or truck is recommended so pressure can be immediately released in case of a leak or break in the discharge line. Also, a pressure gauge on the air line at the tank car or truck is recommended to insure no more than 30 lbs. at any time.

To insure that the compressed air used for discharge of lading be as free as possible from oil, excess moisture and foreign matter, the air supply should be taken from the TOP of the air receiver. This receiver should be drained at regular intervals.

The air line leading to tank car or tank truck should be thoroughly blown out before making connection to the tank, for any moisture admitted will rapidly generate heat and accelerate corrosion of the tank. It is recommended that consignee install an air dryer or water separator in the air line, adjacent to and preceding the air shut-off valve.

### Never unload at bottom

The acid should never be unloaded through the bottom of the tank. (Bottom flanged plate is used only as a washout connection.) Under no circumstances should the acid pipe be uncapped until all pressure in the car tank has been released, by removing the safety vent or opening the air vent, or there will be danger from spurting acid.

The acid discharge pipe is subject to corrosion. When broken or defective threads, holes or cracks in the pipe,

wearing away of the bottom of the pipe, are present, they will interfere with and possibly render complete discharge of the tank difficult. In such cases, replacement should be made with extra-heavy steel pipe.

### Wash off spillage

Damage by the acid to the paint, stenciled markings and tank metal shows the shipper and consignee that unloading was permitted under conditions hazardous to employee and property. Any spillage on the exterior of the tank car or tank truck should be promptly washed off with water to avoid damage, and possible injury to persons in contact with the tank during the course of return.

All pipe and fittings forming the delivery line between the tank car or tank truck and storage tank should be of iron, steel, or other safe material. Corrosive liquids are usually of high specific gravity, and it is important that the delivery line be properly designed and maintained to insure against undue hazards. Installations involving the use of smaller than two-inch diameter pipe, or abnormal length or height of line, should be avoided.

### Dome fittings

Dome fittings should be inspected for evidence of leaks or other defects before unloading and thus avoid possible acid spray after the tank is subjected to air pressure. Should leakage occur, particularly at the dome fittings, unloading operations should be suspended and reported to the supervisor for advice on further procedure. If leakage at the tank car dome gasket cannot be stopped by tightening the bolts or fittings, shut off the air supply, then remove the cover and apply a new rubber or asbestos gasket. A rubber hose for the acid discharge connection should *not* be used.

### General precautions

Under no circumstances should water or other liquid be let into tank cars or tank trucks by consignee, nor should any employee be permitted to enter an empty tank car for any purpose whatsoever.

Empty tank cars should be returned as soon as possible, in accordance with the shipping instructions received from the shipper. Shipper's routing instructions should always be strictly followed.

If all above general suggestions are followed and the specific manufacturers' instructions and diagrams studied and followed carefully, there should be no damage or danger involved in the handling and use of commercial and industrial acids.

## HELICOPTER LICENSED for commercial use

THIS 200-horsepower MC-4 helicopter is manufactured by McCulloch Motors Corp., Los Angeles. It was officially certified by the United States Civil Aeronautics Administration in February, thus becoming the first tandem-rotor helicopter licensed for commercial use. The helicopter gains comfort, ease of handling, speed and maneuverability from its tandem-rotor design. It will be used for carrying passengers, patrolling, exploring, and other commercial purposes.

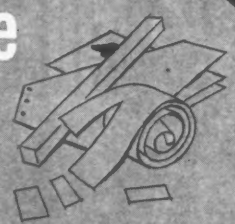
## LUMBER

A supply of superior hardwood, some 4 to 5 billion board feet, lies virtually untapped in Oregon, west of the Cascades. In order of availability, the Oregon Forest Products Laboratory lists the following species: alder, tanoak, maple, madrone, California black oak, cottonwood, Oregon white oak, ash, chinquapin and myrtle. Lack of familiarity, on the part of mill operators, with techniques of hardwood operation and an equal lack of marketing knowledge have been the major obstacles in development of a West Coast hardwood industry.

## CAN TONNAGE UP

CONSUMPTION of steel in the manufacture of cans in the eleven Western States and Hawaii for 1951 increased nearly 10 per cent over 1950. Bureau of the Census figures show 196,891 tons for 1951.


a complete steel service



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Our modern processing equipment is your answer to a faster, more efficient operation...accurate shearing and slitting to your exact strip or blank size, plus mill edging, roller levelling and decoiling. Save time on your production line...use Rich Steel's complete service facilities to process your steel exactly as you require it.

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## ARMY OFFERS research contracts

WESTERN research laboratories, manufacturers with research departments, and manufacturers in general have been offered an opportunity to do research and development work for the Army's Corps of Engineers.

Projects in which the engineer research laboratories are particularly interested include: bridging equipment; soils stabilization; prefabricated buildings that will stand both heat and cold; the problems of distillation, purification, and distribution of water; equipment for the distribution and storage of petroleum products; development and engineering of new methods of mine detection; illumination; earth moving equipment; mapping methods and equipment; and the distribution and generation of power with weight and size of equipment being of primary importance.

The four-fold purpose as outlined by the army were: to develop new engineering equipment for use of Army and Air Force; to adapt or modify existing equipment, when applicable, to meet new, more exacting requirements; to evaluate and adapt commercial engineering equipment to military uses; to evolve the techniques for the employment of this equipment.

## HARDBOARD DIVISION meeting summary

THE FOLLOWING information regarding hardboard is taken from the minutes of a recent meeting of hardboard division of the Oregon Forest Products Laboratory.

In hardboard testing it was found that the only major change in standards pertinent to hardboard has come from Sweden. In that country, industry favors a vertical orientation and the use of distilled water in water absorption tests. The British are using a simulated drop-ball test for a measure of toughness while the Canadians are working on a spear test.

Machinability is a wide open field for research work, being divided into these questions: how can hardboards be machined; and what effect does machining have on cutting tools?

A questionnaire on domestic testing of hardboard produced the following results: Static bending test is good. Thickness is quite important in the water absorption test. Swelling resulting from humidity changes shows good correlation with the swelling values obtained in a water soak test. There is no need for both tests in a standard if there is good correlation.

Linear changes are more important than thickness changes. The imbedding of a 0.1-inch steel rod in hardboard gives an index of hardness. Hardness of the surface appears to be more important than hardness of the board as a whole. Javelin type puncture test seems to be the best for hardness testing. There is no need for a tension parallel to the surface test if a bending test is needed.

### Subject literature

Yale University School reports a doctorate thesis involving a study of pressures, temperatures, resin content, etc., in hardboard manufacture.

Timber Engineering Co. has published a bulletin entitled "How to Evaluate Hardboard Properties." This organization has also made toughness tests using a modified version of the Madison type toughness testing machine, and found good correlation between strength and toughness. Some work has been done on a nondestructive test for analyzing the qualities of hardboard, but results have so far been limited.

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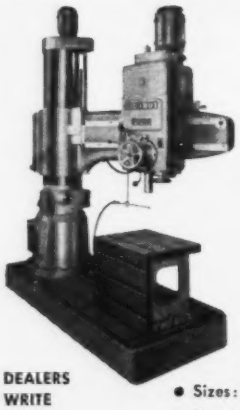

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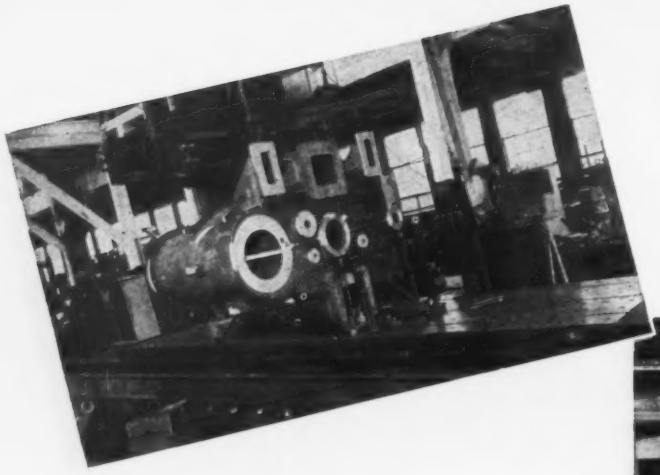
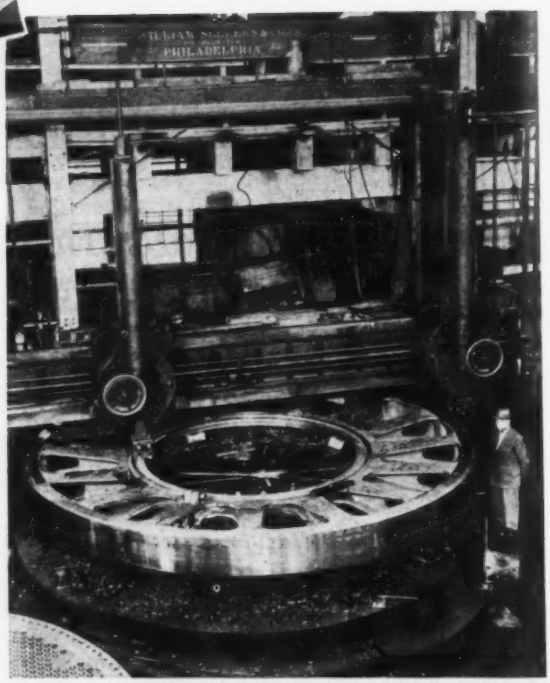
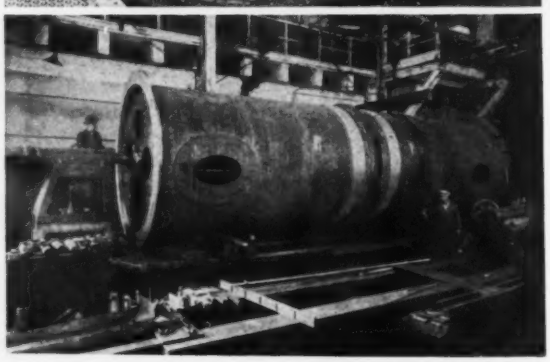


# MACHINING JOBS ARE GETTING BIGGER





## Yes, The Modern Trend Is To Build It Bigger...

**Only at Moore's will you find the variety of large machine tools to hurdle the problem of size.**

1. Openside planer—72″x72″x24′ stroke 25′. 7′3″ under rail with rolling 39′ side table for wide sections.

2. Vertical turning and boring mill—swings 18′3″—clearance under rail 10′6″ (machining alloy steel ring gear).

3. Turning Compeb mill shell on 72″ swing x 39′ between centers. Heavy duty engine lathe. Lathe can be blocked up to swing 124″.

Many other machine tools are available to handle other large work.

Small work too, quantities one to a thousand can be machined at Moore's, quickly and with precision.

MOORE
DRY DOCK COMPANY
THE COMPLETE INDUSTRIAL PLANT

## Moore's Machine Tools Are Available to You for Any Job...Large or Small

For prompt Machining Service Phone or Write Sales Department WI

MOORE DRY DOCK COMPANY
Foot of Adeline Street, Oakland 4, Calif.

MACHINING, GRINDING, FORGING, HEAT TREATING
PLATE–SHEET–PIPE FABRICATION, STRUCTURAL STEEL FABRICATION and ERECTION.

A special insert at book's center gives four pages of directions for using the catalog to best advantage. Arrows and page numbers on pages 2 and 3 make it possible to locate proper thumblift for turning to each category of merchandise.

# MAKING YOUR CATALOG EASY FOR PURCHASING AGENTS TO USE

*Careful designing will make it a convenient guidebook, rather than a "baffle-book"*

By
C. B. WILLIAMS
Purchasing Agent
The Republic Supply Company of California

A MAJORITY of purchasing agents frequently have cause to criticize the design and make-up of catalogs which they must consult, but seldom does an opportunity come for one of us to sit in on the planning of a catalog and specify those features which will make it helpful to the greatest number of people.

When Robert E. Deshon, assistant to the general sales manager at Republic Supply, asked for this writer's opinion on the design of a new catalog, it seemed a good chance to suggest those features most useful to the purchasing agent.

### Daily reference

In his every-day work, a purchasing agent must consult catalogs of suppliers and manufacturers for proper specifications and other qualifying data. He must search for descriptive copy, parallel brands and other pertinent information, so that he may write an intelligent order and avoid getting wrong material, with its wasteful backtracking and corrections.

This is not easy to do with many catalogs; the general criticism being that they are designed only to present the seller's line of merchandise and not to be used by the buyer as a reference for a specific merchandise item.

"What then," I asked, "would be the format of the ideal catalog; and how could such a catalog be designed to provide the maximum of utility to the user?"

These were not questions one could answer immediately, but eventually, after some discussion, we agreed upon a list of features as being essential to a good catalog from the point of view of the purchasing agent.

### Important features

From these requirements, one may judge that catalogs should be designed to make the purchasing agent's functioning orderly and efficient by supplying buying helps, rather than dealing with merchandise alone.

Furthermore, the purchasing agent

recognizes that other departments which have to do with requisitioning and use of materials can coordinate with him better if there is a uniform source of information to be used in connection with ordering. The catalog should fill that need.

## Essential Catalog Features

1. *Index:* An easy-to-use tabulation of contents, with minute cross-references and with each class of item in large boldface type. In addition, the general alphabetical index should be die-cut at edge of sheet.

2. *Categorical divisions:* Have suppliers' merchandise items divided into logical categories; with die-cut thumblifts for quick opening at these divisions.

3. *Conversion tables:* Data showing figure number interchangeability of brands.

4. *Quantity schedules:* For determining best buys.

5. *Useful engineering information.*

6. *Illustrations:* Wherever necessary to supplement text.

7. *Instructions for ordering correctly.*

8. *Product recommendations* for special purposes.

9. *Orderly presentation of merchandise* by well-defined groups so that comparisons between differing items may be easily made.

The type of "Useful Engineering Information" which should be included, as specified in item 5 (see box), would answer technical questions such as the following:

What size socket wrench should be ordered for use on ½-in. heavy hex nuts?

What type and how many teeth hacksaw blades should I use to cut iron pipe?

What size band saw blade do I use on an Atkins #4 power saw machine?

What specific grinding wheel should be used to do cylindrical grinding on hardened steel?

What remedial action or correction is needed for belting trouble; and what are the various causes of trouble?

What type of wire rope construction should be ordered for use on a bulldozer to get best performance?

What type of steel should I specify in steel flanges to withstand service at 1,200 deg.?

How many pipe hangers does one need to suspend 400 ft. of 2-in. pipe?

What does this material weigh? Does it have enough weight to qualify for the manufacturer's factory shipment freight allowance?

What figure number valve is a 200-lb. bronze "R" Stem screwed gate valve?

Such data might not always help the seller move more merchandise directly, but it definitely helps make the book useful to more people; shop men, engineering personnel, purchasing personnel and others who may have a hand in requisitioning materials and supplies.

### Designing the catalog

These, then, were the main points which this writer felt the typical purchasing agent would want in the ideal catalog. Those in charge of design of the Republic Supply Company catalog proceeded to put them into effect with able technical assistance of the experts from R. R. Donnelly & Sons' Catalog Department.

The result was a selling tool which not only presented merchandise in the most orderly and convenient form, but it reached out to perform all the functions of helpful service that the modern salesman must fulfill in order to do a proper and rounded job of selling. And it was this entry of the sales department thinking into preparation of the catalog which balanced the nature of the contents and made it a complete working tool for the purchasing agent.

Designing began at the beginning by showing a list of locations of company main offices and branches, complete with telephone numbers. This was done by using the so-called "linings" of the front and back covers for pictorial maps of California. These indicated graphically the strategic placement of the firm's 15 regional headquarters.

Inset regional road maps also showed the easiest routes by which the main headquarters warehouse at Los Angeles and northern division headquarters at San Leandro in the San Francisco Bay region may be reached for pickups. Locations are all numbered on the map so that they may be easily identified by consulting the corresponding numbers on the inset list of telephone numbers.

### Trade practices

Just before the stepcut index, which is at the very front of the book, the company inserted a page headed "Trade Practices." On that one page are listed answers a purchaser should have in order to write the proper type of order. The following headings will show that essential information for this purpose has been thoroughly covered: "Orders, Prices, Claims, Cash Discounts, Responsibility, Returned Goods, Cancellations, Quotations."

The page and product index itself is not only in large type which can be read in the dimmest light, but page numbers are in 12-pt. bold face block letters. The same is true of the first word in each type of item as "Abrasives, Accessories, Acco Chain, Acetylene Hose, Adapters, Adzes, Adjusters, etc."

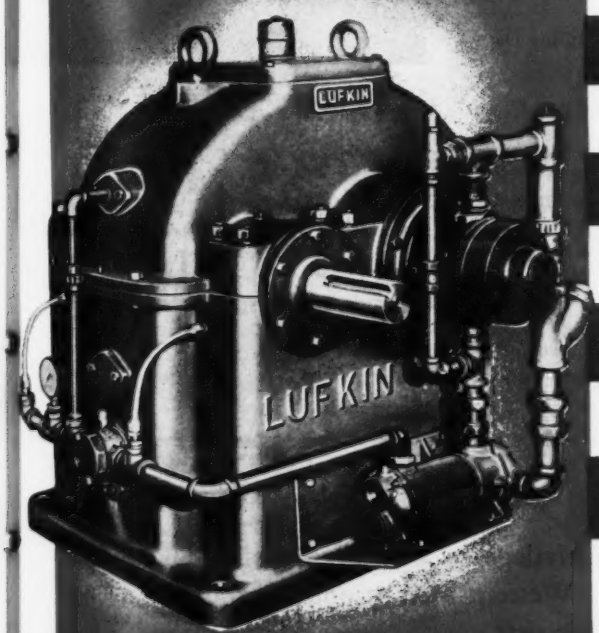
A special section index which is a model of compression and efficiency occupies two facing pages of a four-

*Continued on page 120*

**Product Index has been stepcut at the side for quick location of items, and main product designations and page numbers are in boldface type.**

Lufkin

# HERRINGBONE GEAR SPEED REDUCERS AND INCREASERS




LUFKIN, TYPE N "HIGH SPEED"

**ANY SIZE**

3 TO 2000 H. P.

**ANY SPEED**

0 TO 12,000 R. P. M.

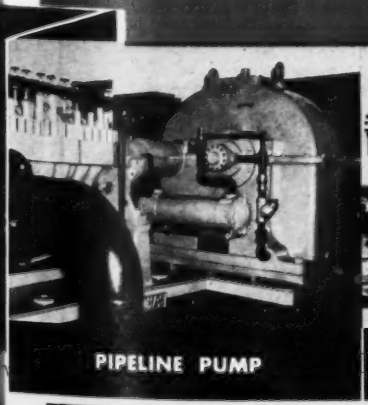
**ANY RATIO**

1 TO 1 TO 70 TO 1

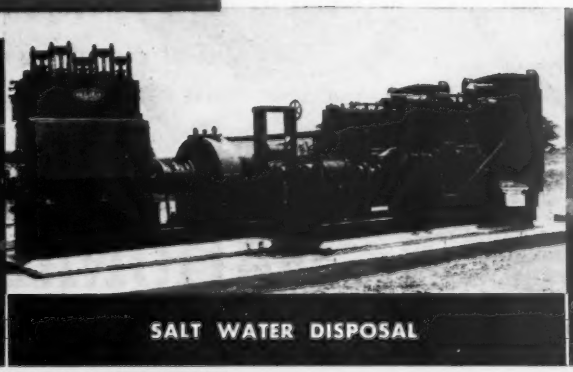
**ANY JOB**

WHERE SPEED IS REDUCED OR INCREASED . . . . . .

**Eighty Different Sizes From Which To Choose**



PIPELINE PUMP



SALT WATER DISPOSAL

ALSO SPIRAL BEVEL REDUCERS FOR COOLING TOWERS

LUFKIN FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

*Branch sales and service* Houston, Dallas, New York, Tulsa, Los Angeles, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Wyoming; Great Bend, Kansas

**PACIFIC COAST DIVISION—5959 So. Alameda, Los Angeles 1, Calif.**

## CATALOG DESIGN

. . . Continued from page 118

page insert on green paper set in the center of this 904-page book. A single diecut thumblift leading to it is labeled "Index." A pull at this lift opens the book at "Section Index," the two inside pages of which list page numbers of all important sectional categories of merchandise. Blank thumblifts opposite each listing enable the user to reach them *by touch* and to find any particular section instantly.

### Who to ask for

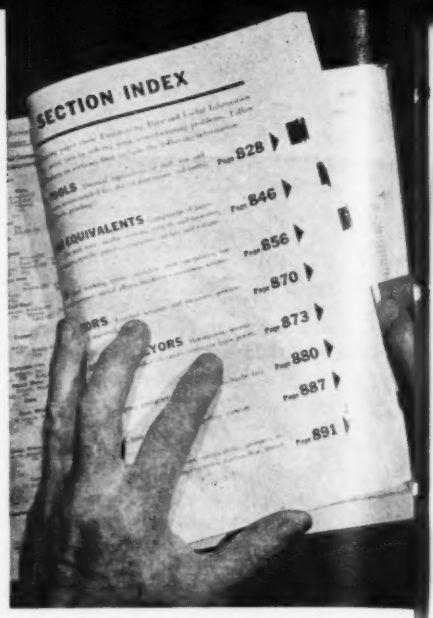
The outside pages of this insert, pages 1 and 4, are devoted to information which further simplifies the process of ordering, particularly by phone. Page one is headed "Helpful Information. To assist you in obtaining prompt answers to your questions, the following may be helpful:" Then follow two main headings near the top of the page:

| WHEN YOU CALL ABOUT | ASK FOR |
|---|---|
| Placing an order | Order Dept. |
| Availability of the product | Order Dept. |
| Price information on goods to be purchased | Order Dept. |
| Product information and products not listed in Republic Catalog | Order Dept. |
| Price and delivery information on formal quotations | Quotation Dept. |
| Price information appearing on invoice (taxes, prices, terms, etc.) | Price Dept. |
| Delivery information | Expediter |
| When will I receive my invoice? | Expediter |
| Routing information or tracing shipments | Traffic Dept. |
| Damaged goods | Traffic Dept. |
| Additional copies of invoices | Billing Dept. |
| Information regarding month-end statements | Accounts Receivable |

Page four of this insert is devoted entirely to a "Service Directory," listing under four-column headings the location, address, telephone number and teletype number of the company's 15 establishments in California.

### Engineering information

The last thumblift indicated in the sectional index on the center insert, lists "Engineering Data and Useful Information." The first page of this section is in turn indexed by categories with arrows and page numbers which make finding the proper page easy by pointing to corresponding groups of black grouping tabs at the edges of the pages in each category for easy location.




**Section Index locates engineering information for each class of merchandise.**

**You are invited to visit our booth at the Western Metal Congress and Exposition in Los Angeles March 23 thru 27**

***Booth No. 703***

It is a privilege to be represented at the Eighth Western Metal Congress and Exposition this year.

Of interest to the trade is National Steel and Shipbuilding Corporation's entry into the field of Al-Fin Molecular Bonding.

Our staff of consulting engineers is available to assist you with design and production problems.

**NATIONAL STEEL AND SHIPBUILDING CORPORATION**

**Harbor Drive at 28th • San Diego 12, California**

Finally, to leave no stone unturned in the effort to include all necessary information for a purchasing department, the catalog employs the last two pages for complete postal information and a chart of "Decimal Equivalents," such as is posted in every engineering department and is part of the equipment of most purchasing agents in the hard goods fields.

### Conclusion

These features, then, seem to be the answer to the question "What does a purchasing agent want in a catalog?" —which was asked me by Robert Deshon at the beginning.

When the final product appeared, it became apparent that the opinion of one man would never have answered that question completely. The final answers not only embodied opinions and desires of more than one purchasing agent, but they included and coordinated the requirements of the engineering department, the shopmen, and finally the sellers themselves.

Thus they can do a good job of servicing orders, with a minimum of misunderstandings, backtracking and all the other waste motions of purchasing procedure, which can mean lower costs and extra profit for all concerned as they are eliminated.

## NEW MINING METHOD effects big savings

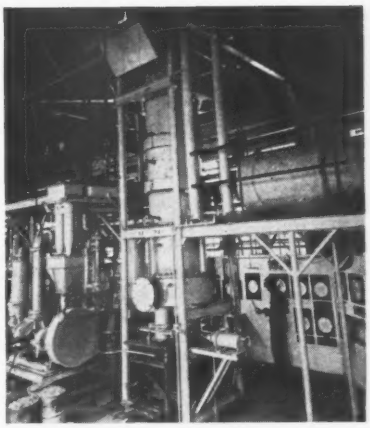
USE OF the caved-block method to eliminate long truck hauls in open-pit operations at the Inspiration Consolidated Copper Company in Arizona has brought the following results for the first year of use:

1. Reduction in costs on ore below the 2,650-foot level originally planned for open-pit operation.
2. Solution of the sizing problem with installation of crusher.
3. Additional ore tonnage for open-pit operation through solving of sizing and transportation problems.
4. Fuller use of existing facilities and equipment that otherwise might be idle, at the same time releasing power shovels and trucks for other work.

The method is described as a stope, or funnel, into which low-grade ore within 1,000 feet is carried and dumped by bull-dozers and carryalls operating on the 3,650-foot level. The ore falls 241 feet below the 3,650-foot bench through grizzlies for sizing. From the grizzly screens the ore is dumped into ore cars and hauled to block-tackle hoists for milling.

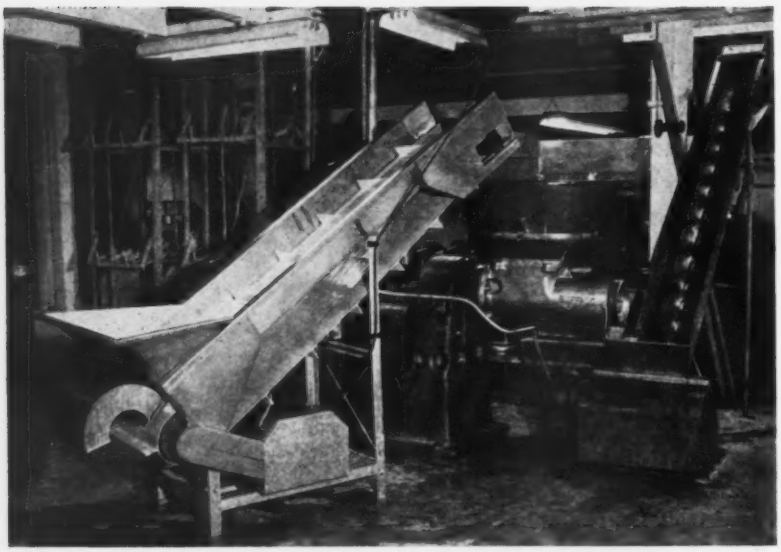
The present operation, first of a successive series to be used as open-pit work lowers the ores, has released 13 trucks of 32-ton capacity and 6 of 25-ton capacity for pit haul only.

## OIL-SHALE demonstration plant



THIS is an interior view of the Gas-Combustion pilot retorting plant at U. S. Bureau of Mines oil-shale demonstration plant near Rifle, Colorado. Oil shale is mined and then hauled in diesel trucks to the crushing plant. From here, shale is available for retorting and crude oil for storage and eventual refining.

You are cordially invited to visit
The FABRIFORM Exhibit
BOOTH 465
when you attend the
WESTERN METALS EXPOSITION
Pan-Pacific Auditorium
March 23 to 27, '53
See how
COPPER FURNACE BRAZING
can save you
TIME-LABOR-MATERIAL
• Cuts Fabricating Costs
• Increases Production
• Steps up Profits!
You'll See
• Hundreds of sample parts
• Scale model copper brazing furnace
• Case Histories proving many advantages of copper furnace brazing
• Many pictures of typical work
Let "SAVING DAN"
THE FABRIFORM MAN
answer your metal joining questions
FABRIFORM METAL PRODUCTS
"SPECIALISTS IN METAL JOINING"
7720 MAIE AVE. KIMBALL 9261 LOS ANGELES 1, CALIF.



**ELEVATORS LIFTING** filled cartons of meat and hamburger. Note parallel roller conveyors leading to the elevators. Crossing the left corner is the "skate conveyor" leading from the carton set-up room above to the packers which are just beyond conveyors shown.

# MEAT MEETS M-H

## *From head saw to hamburger, this plant has chopped away handling costs*

*The Kaufmann Meat Company of San Jose and Santa Clara, Calif., has completed an ingenious new system of materials flow, in its meat manufacturing plant, that frees nearly all personnel from materials handling within the plant.*

*These workers can now be shifted into direct production jobs. The hand truck, so familiar in most meat packing houses, has been rendered almost obsolete by this new system.*

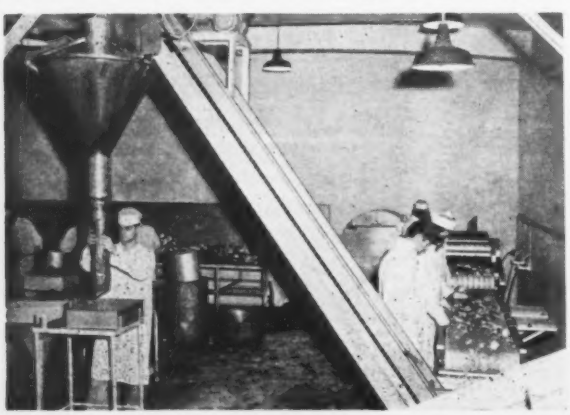
Joe Kaufmann, founder and president, working with his top personnel, including Gene Thompson, manager of the boning plant, and Fred Bentley, plant engineer, has installed an automatic conveyor system for the Santa Clara boning plant such that not a single moment of a single worker is taken up in transporting bones by hand or by hand truck.

This elaborate and efficient system of conveyor belts, chutes, rollers, elevators, worm screws, slides, and skate wheel conveyors allows bones to pass through the various processes and ultimately be dumped into a waiting truck without being transported by hand or even slowed down along the way.

With almost every known conveying principle being utilized, this idea is conceivably adaptable to many different types of manufacturing.

The system begins with what is probably the longest traveling meat

**PACKAGING** diced meat. At lower right, diced meat is carried on conveyor belt to hopper (hidden) and then up step conveyor in foreground. Then it is dropped in the funnel, forced into horn by the worm screw and into waxed bag held by the worker.



**TWO-PART DICING** machine method. Each machine is identical, one cutting the meat into strips, the other cutting the strips into diced sections. The meat is carried to each machine and away by an endless belt leading to the packing assembly.

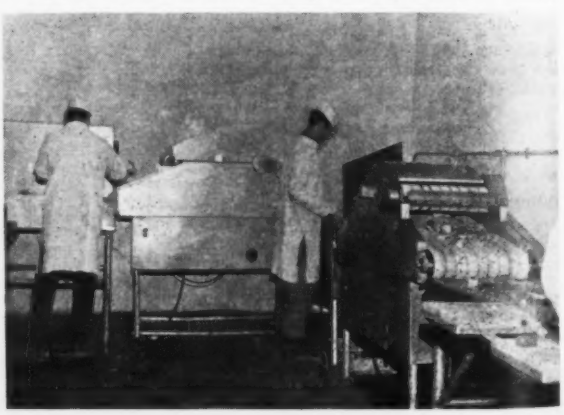


table in the world. Animal carcasses are halved by a breaking saw at the head of the table, and each half is tossed on the table by the worker.

Boners stand on either side of the table for its entire length, each one performing a specialized operation. As the carcass or portions thereof pass before each boner, he removes the proper section and separates the bones from the meat.

### No bind on bones

He then tosses the stripped bones on a conveyor belt suspended directly above the center of the moving table. This belt, starting at about five feet above the floor, is inclined gently upward to a height of about seven feet at a distance of approximately 40 feet down the length of the table. It is supported by a frame which in turn is suspended from several pairs of rods attached to the ceiling.

The bones are carried along this belt, which is high enough not to interfere with other operations, to the end where they are dropped onto a transverse belt crossing the boning room. The transverse belt brings the bones to an inclined gravity chute cut through a wall separating the boning room from the trimming room.

From this chute the bones fall on another traveling table, a belt crossing between two rows of trimmers, who strip all remaining meat from the bones. Much of this is used for hamburger meat. The almost completely dry bones are dropped back on a table which brings them to an inclined chain conveyor. This chain carries the bones upward through a window to the outside of the plant, where they fall into a truck. The truck carries the bones to the rendering plant for an entirely different processing method.

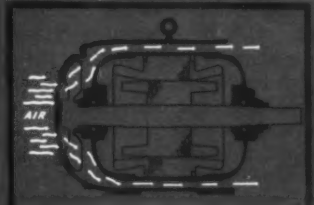
### Speed with care

Turning back to the original traveling table again, the boned meat travels a similar course, but is handled with greater respect. This meat is placed on a second overhead conveyor suspended directly under the first conveyor and starting at a point about half way down the length of the moving table.

This belt carries the boned meat to the end of the table, drops it on a short chain conveyor which climbs upward about a foot and a half, and then drops the meat down a chute leading to another belt traveling backwards. The belt passes along the fat trimmers table for further processing, and the meat is inspected by an Army medical corpsman and by the company inspector.

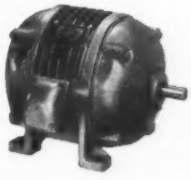
*Continued on page 124*

**LET THESE MOTORS DO YOUR DIRTY WORK**




**They're built to ignore dirt, dust and corrosive vapors**

*SMITHway totally enclosed fan-cooled motor—a frame within a frame and both are cast iron. Efficient, high-capacity, double-locked fan forces air through self-cleaning ducts. Heat is dissipated—dirt, dust and corrosive vapors can't get into the sealed motor.*



*SMITHway totally enclosed non-ventilated motor. Standard NEMA frames. Cast iron construction of all exposed parts keeps these motors, by the thousands, on the job regardless of dust, dirt and corrosive conditions. Available in ratings from 1 to 5 HP.*

Cast iron construction is one of the many outstanding features which makes these motors superior under service conditions involving dirt, dust and corrosion. Cast iron frame, cast iron end bells—the complete enclosure is cast iron—all exposed parts are cast iron. Ideal for petroleum, chemical and other rugged industrial applications.

SMITHway totally enclosed fan-cooled motors are built to standard NEMA frames to meet the highest standards of electrical performance. TEFC motors are built in sizes from 5 to 125 HP. Parts and service available throughout U.S.A. Get complete information from nearest office or write today.

79th ANNIVERSARY 1874 - 1953

**A.O.Smith**

ELECTRIC MOTORS

PACIFIC COAST DIVISION—5715 SMITHway St., Los Angeles 22 INTERNATIONAL DIVISION—Milwaukee 1
Offices—Stock Exchange Building, 155 Sansome St., San Francisco 4; White Building, 1338 Fourth Ave., Seattle 1; P. O. Box 1721, Boise; 930 - 17th Street, Room 501, Denver 2.

## MEAT MEETS M-H

. . . Continued from page 123

The cuts are sorted and placed in different bins adjacent to the fat trimmers' table and for a few moments the meat remains stationary in these bins. The boxer removes meat from the bins, wraps the cuts in heavy brown waxed paper and places them in uncovered boxes. As each box is filled, he puts the box on a roller conveyor inclined at a low angle downward to take advantage of gravity.

Supplemented by a small power belt conveyor, the rollers carry each box to a chain-operated elevator which raises it to a height of about ten feet and then drops it on a second roller gravity-operated conveyor. This conveyor, immediately above the first roller conveyor, carries loaded box trays in the opposite direction, around a curve and through a wall opening leading to the loading dock.

On the dock the boxes are weighed, tops are placed over them, and they are closed and strapped. Roller conveyors carry them as close as possible to the truck platform, where they may be palletized, awaiting removal. And here, once more, there is no actual handling from breaking saw to loading dock.

**ARRANGEMENT of the step conveyor, primary grinder, and screw conveyor.**

As an example of the completeness with which the conveying system has been planned and installed, the cardboard boxes themselves, in which the boned meat has been placed, are delivered by another automatic conveyor method to a small mezzanine located directly above the boning room. The boxing material is lifted into this penthouse workroom through a small door by a fork lift truck.

Like the box trays, the bottoms are set up and the assembler sends them through a slot down one or the other of two parallel skate wheel conveyors which lead to the packagers. One conveyor leads to the boned meat section, the other to the hamburger meat packager on pairs of wheels resembling roller skate wheels, set inside the frames of the conveyors. They operate like roller conveyors utilizing the force of gravity.

Electric signals are attached to points on these conveyors which turn on red lights in the assembly room so the worker knows the conveyor will not take any more boxes. At other times the light shows green.

### Box handling cut one-half

In the meantime another worker is assembling the tops of the cartons which he drops down one or the other of two parallel vertical drop-chutes which have been formed by wire frames. These lead to the weighers and strappers. Maintenance Engineer William Fowler estimates that this part of the conveying system alone cuts the box handling time to about one-half.

To review the next phase in the conveying system we must turn back to the fat trimmers' table and to the bone trimmers' table. The fat has been dropped into galvanized iron barrels and is wheeled away by hand. The hamburger meat from the bone trimmers and elsewhere must also be wheeled in the same way to the processing machines. Bentley, who is largely responsible for creating so efficient and elaborate a conveying method, is reported to be at work devising a

a Bigger, Better WISCONSIN
HEAVY-DUTY Air-Cooled
ENGINE
16% More Power For Your Equipment
The NEW Model VG4D 25 to 36 H.P.
MORE Power TO FIT THE JOB
MORE Power TO FIT THE MACHINE

Another engineering achievement . . . the NEW Model VG4D V-type 4-cylinder Wisconsin Heavy-Duty Air-Cooled Engine, increasing the power range to 36 hp. — a power gain of more than 16% over the VP4D, former top engine in the line.

The NEW Model VG4D is an exceptionally smooth-running, even-firing engine. Its light weight and compactness in design simplify the problem of engine installation on modern equipment where weight and space limitations are important factors.

Every one of the traditional Wisconsin 4-cylinder features are built into this new model. These include, to name a few, tapered roller main bearings, dynamically balanced forged crankshaft, mirror finish on crank pins, Stellite-faced exhaust valves and valve seat inserts and honed cylinders for long, dependable, heavy-duty engine life.
The Model VG4D engine is definitely Tops in Performance, delivering a maximum of power per pound of engine weight, at minimum operating and maintenance costs.
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means to force the hand truck out of these processes.

After the meat is brought to the processing machinery, it starts again on an elaborate automatic trail. The meat scraps are loaded into a hopper about three feet above the floor, then a step conveyor carries it upward to drop the meat into the first grinder through another hopper.

The coarse ground meat is ejected from this grinder into a third hopper, and once again is carried upward by a screw conveyor encased in a stainless steel tube. It then drops into another hopper leading to a second finer grinding machine, after which it is forced through a squared mold to form hamburger loaves.

It is now at the packaging desk, which sits parallel to the trimmed meat packer's desk. The hamburger meat packager receives the box cartons from above, wraps the loaves, sends the boxes down a roller-conveyor chute, up an elevator, and down another roller conveyor, each of which is parallel to the corresponding assembly used for the regular meat processing.

There remains one more phase. Meat that is to be diced or cubed is carried by traveling belt between the two dicing machines used in the operation. After it has been diced, the meat is lifted up by a step conveyor to an overhead hopper. The diced meat drops into this funnel-shaped hopper and is driven through the stuffing horn by a screw conveyor.

Over the bottom of the horn a worker has placed a waxed bag into which the meat is driven. When the bag is full, the weight is the same as for every other bag. These bags are placed in boxes which are slid onto an automatic conveyor leading to the weighers and strappers.

Because of the shortness of time in which the method has been in use in the plant, it is hard to estimate the exact amount of saving. Plant capacity has been stepped up and except for the few instances noted, all labor is directed toward the constructive producing operations rather than to carrying and handling.

## NEVADA NUGGET nixed

NEVADA'S "FREE PORT" law passed in 1949, which virtually enabled by-passing California sales tax, has been given the "thumbs down" treatment by four major railroads. The law permitted tax-free storage of out-of-state property if subsequently reshipped to points outside Nevada. The railroads nixed it by refusing to give storage-in-transit privileges.

TOWMOTORS IN ACTION IN U. S. INDUSTRY

Loading a 1,200-pound cargo of castings into an American Airlines freighter.

# Right on schedule . . .

However tight the timing and whatever the type of load . . . Towmotor measures up to stiffest materials handling requirements, while bringing man-hour costs 'way down in the bargain. Write for your copy of "Man-Hour Thieves," Towmotor's new handbook for lowering plant operating costs, and name of your nearest Towmotor Representative. Towmotor Corporation, Div. 6703, 1226 E. 152nd St., Cleveland 10, Ohio.

Make the Towmotor Exhibit your first stop at the 5th National Materials Handling Exposition starting May 18, 1953

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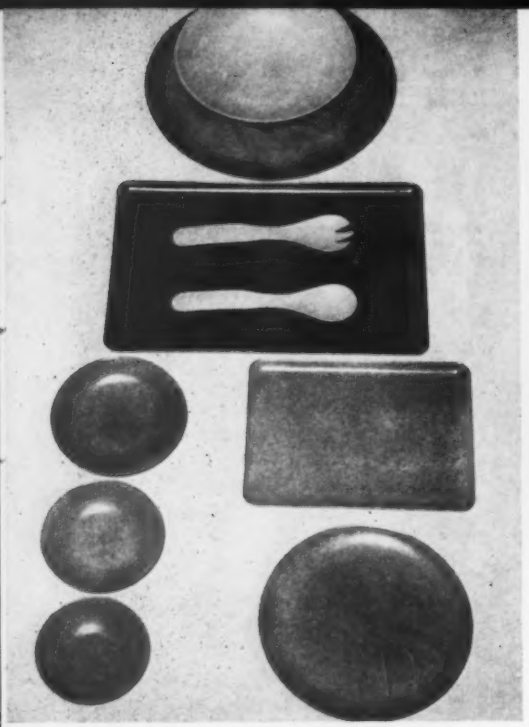

**TYPICAL "FLINTWOOD" PRODUCTS** are shown at left. They are items of tableware that will not break when dropped, yet have attractive appearance. Above, Earl Jackson displays (right) a tray made improperly from a large quantity of wood flour and small quantity of resin. Crack due to wood flour materials is in area improperly bonded by resin. Properly made tray is shown at left.

# CONVERTING WOOD SCRAPS

## *into unbreakable tableware*

**ABILITY Products Company at Pasadena, Calif., has developed a new means of converting wood scraps into a light and attractive looking tableware that is durable and practically unbreakable.**

**Flintwood, as the new product is called, is manufactured from a finely-divided wood flour mixed with a powder-type urea formaldehyde resin. This process combines the tremendous strength potentialities of cellulose fibers with the binding properties of the resin. Eighty per cent of the finished product is derived from wood scrap converted into flour by a conventional pulverizing machine.**

**FEMALE MOLD** for Flintwood bowl being machined from tool steel. Less expensive tooling would not stand up long enough.

Workers mix this wood-flour with a powder-type urea formaldehyde resin, the purpose of which is to bond the tiny wood particles when they are molded with heat and pressure. This is analogous to the act of adhering sand and gravel particles with Portland cement in the production of concrete.

Wood flour is nothing new to manufacturers of plastic products. It has been incorporated in casting resins and molding compounds over a period of at least 30 years. But its principal purpose, heretofore, has been that of a "cheapener" or "bulking agent."

In other words, it reduced the relatively-high cost of plastic resins by increasing their volume. Physical properties of the products made therewith were primarily due to the characteristics of polymerized resins, because the latter comprised more than half of the materials actually used.

Engineers have known for many years that cellulose fibers of wood have tremendous strength potentialities if they are properly bound together. In fact, it is Mother Nature's technique of resin-bonding cellulose fibers that has caused wood to become one of the most widely-used structural materials.

However, most efforts to utilize the properties of wood fibers in reclaiming sawdust and other scrap materials have failed, because the proper ratio of fibers and adhesives could not be used.

Carl Reininger of Ability Products was able to overcome difficulties associated with the molding of a mix containing 80% wood flour by developing a process whereby a wood and resin mix could be thoroughly dispersed prior to the use of heat and pressure. In doing this, he decided to make use of a powder-type adhesive because it is easier to disperse two powders than to mix a liquid and a powder in the proportions that were required.

Monsanto Chemical Company's Lauxite UF-71 resin proved to be an ideal adhesive in this connection for several reasons.

First of all, it is a thermosetting resin which can be obtained as a heat-fusible powder; yet it cannot be re-

softened with heat, once it has been molded. Secondly, it is one of the few plastic resins that can be pigmented with many light colors without danger of eventual fading (due to the "aging" of a molded product).

Finally, it is capable of producing adhesive bonds that are stronger than the bonds in natural wood and can insulate the particles in wood flour so that the latter will not be susceptible to moisture after they are bonded.

Powder materials for Flintwood products are mixed prior to molding operations by means of a centrifugal machine which is functionally the same as dough-mixers used by bakeries. Then the quantities of mix that are required to mold individual products are hand-loaded in the female cavities of molds mounted on three compression presses.

Incidentally, the molds used in this work are machined-steel tools (since less expensive units would not meet the subject production requirements). The presses include one 300-ton and two 200-ton machines.

The molding materials are heated to 325° F. as the presses are closed. Compressive forces exerted on the materials range from 2,500 to 3,000 psi., depending on the dimensions of the articles that are being produced, and the average molding cycle is four minutes.

When it is removed from the die cavity of a compression press, a molding usually has small quantities of "flash" around one of its edges. Flash is due to the exudation of molding materials into spaces between the mating surfaces of dies during the molding cycle, and this must be removed with grinding equipment. However, no other processing operations are required after the molding cycle is complete. Pigments added to the molding compositions prior to presswork give Flintwood products a permanent built-in finish.

About 2% to 5% of the products to date have been rejected because of various defects, most of which are attributable to the inadequate bonding of wood materials. However, this indicates no basic deficiencies in the process developed by Mr. Reininger, since the successful production of moldings of any type is dependent to a great extent on unpredictable factors such as weather conditions, mechanical failures, and mistakes in the compounding of materials.

Although most Flintwood products to date can be classed as tableware, virtually any article that can be compression molded could be manufactured by means of Reininger's process.


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**Saved 50% handling costs!**

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**this one was a toughie!**

Diesel springs, heavy and unwieldy, formerly were shipped loose in railway cars. At the point of assembly, each of eight component parts of the spring had to be handled separately. Signode, with the foundry men, worked out a new idea. Three pre-bundled spring assemblies were strapped onto an inexpensive pallet. When the springs reached the assembly line, the steel strapping was left on the individual spring bundles until they were mounted in place. This bundle method cut handling cost 50%!

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# BOOKS FOR INDUSTRY

### SHELL MOLD CASTING— methods and applications

Technical advances which enable the manufacturers of metal castings to make better and wider application of the new shell mold casting process are described in a technical report now available from the Office of Technical Services of the U. S. Dept. of Commerce. The report describes the following advances: (1) design and fabrication of equipment for using the process on a job lot basis; (2) tests to develop the best materials and techniques for the process; (3) tests to determine the metallurgical characteristics of the process. The section on equipment describes designs for: molding machines, a core blowing machine, mold stripping equipment, curing ovens, investment mixing equipment, and mold bedding boxes. Under "Improvement of Process Techniques," the report describes compositions and methods for applying: molding resins, sands, parting agents, wetting agents, investment additives and spray coats. Another section of the report describes experimental job lot production of shell-mold castings in aluminum, ductile cast iron and carbon steel. In a concluding section, recommendations are given for the best practice in: production equipment and mechanization, investment materials, sands, investment mixing, pattern equipment, gating and heading, dimensional tolerance, closing molds, cores and plant safety. Titled "Report of Investigation of the Shell Molding Process" and priced at $1.50, the booklet may be obtained from the *Office of Technical Services, U. S. Dept. of Commerce,* Washington 25, D. C.

### GETTING THE MOST from engineering staffs

How almost 500 companies employing 106,000 engineers are improving engineer utilization is disclosed in a report by the NSPE. The report points out that industry could use engineers more effectively by analyzing staff assignments and by standardizing and simplifying many routine engineering jobs so that they could be done by supporting personnel. Other methods which have proved successful in using engineers more effectively are also given. Copies may be obtained at $2.00 each from the *National Society of Professional Engineers,* 1121 Fifteenth St., N.W., Washington 5, D. C.

### TRAFFIC MANAGEMENT for industry

*(Reviewed by W. H. Adams, Traffic Manager, Shell Oil Co., San Francisco)*

This book by Thurman W. Van Metre of Columbia University, entitled "Industrial Traffic Management," is designed to deal with the physical operation of "for hire" transportation facilities and various business practices and policies involved in using the services of these facilities. The text is quite comprehensive and includes explanations of what "traffic management" means, the most important problems of a traffic manager, background and history of these problems, and what has been done about them by various regulatory and private agencies. The result is a useful contribution to a better understanding of the complexities surrounding modern traffic and transport. It is especially adaptable to being read with profit by executives having jurisdiction over traffic managers. Volume is priced at $6.50. Publisher is *McGraw-Hill Book Co.,* 330 West 42nd St., New York 36, N. Y.

### LATEST ON ADDITIVES in industrial oils and greases

New and late developments in the field of additives are described in a new booklet prepared by the Petroleum Educational Institute. A complete explanation is given of the problems that can be solved by additives, what their action is, how this action attacks problems, several tests made to evaluate merits, and procedure of the "L" series and other tests used to evaluate additive type oils. The booklet, containing 80 pages and 110 illustrations, is available for $1.50 from the *Petroleum Educational Institute,* 9020 Melrose Ave., Los Angeles 46.

### POPULATION FORECASTING— a new technical manual

Here is a comprehensive treatise on this subject—a technical manual on methods of forecasting population in


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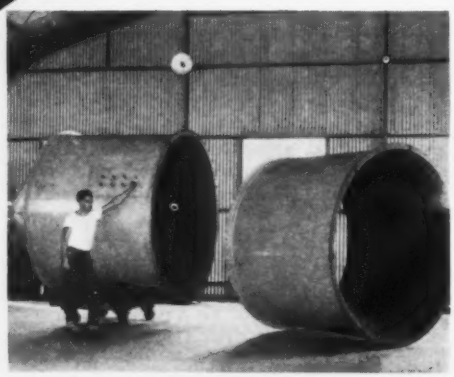

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regions, states, areas and communities. Here's what the manual does: Reviews problems involved in forecasting and basic data needed; describes methods in making projections; tells how the effects of local physical and economic conditions can be analyzed and appraised; suggests and illustrates step-by-step procedures; points out desirable adaptations of suggested general procedure in developing projections for special types of areas. Titled "Better Population Forecasting for Areas and Communities," the manual is available at 25¢ per copy from the *U. S. Dept. of Commerce,* 315 Flood Bldg., San Francisco 2. The guidebook was written by V. B. Stanbery, Economic Analyst for Area Economic Development in the Department's San Francisco office.

### NEW MEXICO for the small business

"The Business Venture in New Mexico" has been written primarily as a handbook for the small businessman, and especially for the individual who is considering launching his own business enterprise in New Mexico. The book takes the prospective businessman through the basic steps of finding and investigating business opportunities, selecting a form of organization, and establishing his business under New Mexico law. New Mexico is, in a sense, a new state with many attractions for many small industries considering establishing a business or branch; this book will serve as a valuable source of information for them. *Bureau of Business Research, University of New Mexico,* Albuquerque. $2.00.

### A GUIDE BOOK on materials handling

Thirty-two fundamental principles of material handling engineering are presented in this new booklet published by the Industry Educational Committee of the Material Handling Institute. The manual is designed for a 3-fold purpose: (1) helping production management to capitalize on the cost savings inherent in improved handling methods; (2) giving material handling engineers a guide book to procedure; (3) providing teachers and students with better course material. Sections of the booklet deal with methods of analysis of material handling problems, and methods to help an engineer compute costs and savings accurately. Copies of the booklet may be obtained for 50¢ each from the *Material Handling Institute,* 1108 Clark Bldg., Pittsburgh 22, Pa.


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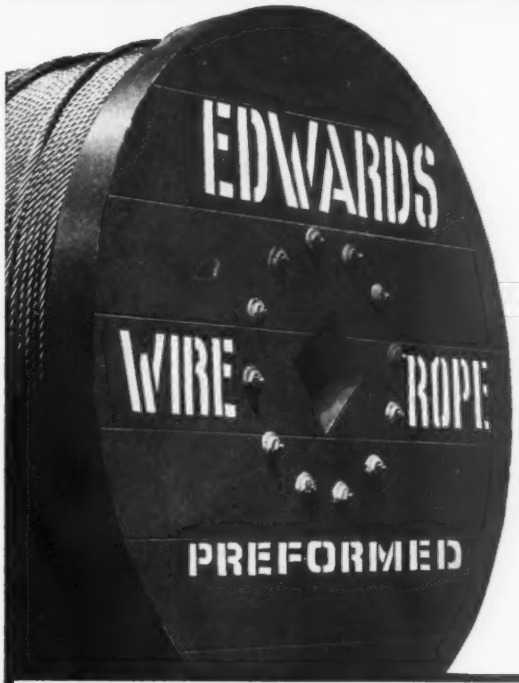


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# HELPFUL LITERATURE

**for the plant operator who wants to keep informed**

*Use rip-out post-card for your free copies*

1

### Flame cutting . . . here's how it works

This attractive 40-half-page-size brochure will tell you all about flame cutting, what it is, why it is, how it works and how to go about this process wisely. Various torches are illustrated and described. Cutting tip selector chart—including tip drill sizes, and how to select tip types are two handy charts in back of booklet. Offered by *National Welding Equipment Co.*

2

### Surface cleaning by sand blasting method

A descriptive bulletin on 600-lb. Belmont Sand Blaster is now available from *Vacu-Blast Co., Inc.* Most important feature of this machine is a new type nozzle which speeds up sand blasting of paint, rust or scale.

3

### A small library of bulletins

From *Heat and Control, Inc.*, comes four bulletins. One considers *Bloom Engineering Co., Inc.'s* high thermal release combination gas and oil burner type HTR. Another is on same firm's LP 16-oz. atomizing air oil burner. Two bulletins, Nos. 118 and 141, respectively, explain *Askania Regulator Co.'s* jet pipe principle and its edge position control as a simple, effective method for controlling position of a moving web.

4

### For more welding dope

*Stryco Manufacturing Co.* offers a veritable welding library of seven informative bulletins complete with charts and illustrations. Data covers rocker arm type spot welders, automatic band saw welders, rod welders, heavy duty resistance welders, automatic air drive, and automatic motor drive—all Stryco products.

5

### Vapor wrapper keeps out rust

A 16-page brochure from *Nox-rust Chemical Corp.* will tell you the whys, wherefores, and applications of Nox-rust vapor wrappers which eliminate necessity for dipping metal parts into oil or grease-type rust inhibitors. Usage methods are pictured plus diagrams of forms in which product is available, and questions and answers about Nox-rust.

6

### "Grits and grinds"

Volume 43, No. 12 of Grits and Grinds is a special issue devoted to related subjects of carbide tool grinding and diamond wheel conservation. Three timely articles included in issue are: "Micro-Finishing Carbide Tools" (a new abrasive belt method); "Silicon Carbide Wheels" (for grinding carbide tools); and "Grinding Carbide Tools with Electrolytically-Assisted Diamond Wheels." Magazine is published by *Norton Company.*

7

### Wire rope sling handbook offered

A fat new 64-page handbook on Leschen slings and fittings is now available from *A. Leschen & Sons Rope Co.* Printed in a handy 4¾ by 6½-in. size, it contains over 100 illustrations showing standard wire rope slings, grommet slings and multiple part slings. Charts give calculations for determining sizes required and correct sling angles in relation to loads. New line of red-strand 8-part braided slings is featured. (FS-52)

8

### A glimpse into an industrial laboratory

In an album-like brochure, *Truesdail Laboratories, Inc.*, shows you snatches of its inner workings. Publication also tells how your own project would be handled. Typical services of this laboratory are listed.

9

### Brass brochure

A 12-page booklet on Formbrite is a new release by *The American Brass Co.*, manufacturers of this drawing brass. Publication lists metal's physical properties and contains helpful information on pressroom and finishing room procedures. Case histories of this relatively new metal are reported to show how applications have contributed to better finished products at lower production costs. (B-39)

10

### Facts on an explosion-proof, totally-enclosed motor

*U. S. Electrical Motors, Inc.*, has just published a carefully prepared bulletin describing its line of totally enclosed motors. These motors, protected against burning or exploding, are presented along with an explanation of their various uses in industry, illustrations and specifications. (1784)

11

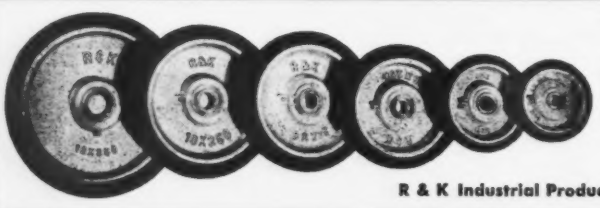
### On a complete line of flexible tubing

A complete line of flexible tubing, in diameters from less than one inch to 30 in., is described in a new bulletin prepared by *Flexible Tubing Corp.* Adaptability to various industries is explained and illustrated. Advantages listed include retractability, light weight, complete flexibility, and resistance to kinking and collapsing. (C2-3)

12

### All about electrolized tools

Thirty-five pages bound between sturdy covers give complete information, by illustrations, charts and facts, on cutting tools and wear parts which are made extra durable by "electrolizing." This process combines high voltage with a chemical bath to pro-

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duce a hard, thin, evenly deposited case on cutting edges or wearing surfaces of tools and other parts. Deposit, while hard, is said not to chip or peel and is not brittle. Internal structure, grain structure, shape, and surface finish of tool or part are not affected. Published by *Electrolizing Sales and Tools, Inc.*

13

### Aircomatic welding guide

*Air Reduction* presents a new 12-page booklet describing the equipment and supplies employed in Aircomatic welding, Airco's inert-gas-shielded metal arc process. It contains detailed descriptions and illustrations of new Aircomatic Guns and the Aircomatic Head for automatic operation. (ADC 717B)

14

### Goodrich offers hose booklet

*B. F. Goodrich Co.* is making available a booklet describing nine types of oil hose for use in refineries and distributing terminals, on oil terminals and barges, or other services where flexible connections are necessary. Included are hose specifications, descriptions of materials and methods used in construction, and recommended uses.

15

### Facts on carbide alloys

A new 32-page brochure on sintered carbides, containing the most recent information on new applications as well as new production techniques, has been published by *Carmet Division of Allegheny-Ludlum Steel Corp.* General information is given on special grades of machining steel, cast iron and nonmetallics. Also included are lists of available blanks, tools, and die sections along with suggested methods for their use.

16

### Cut costs with continuous casting

Instead of throwing out wasted lengths of castings, *Kinkwell Bros., Ltd.*, recommends Asarco continuous cast bronze bars cut to your required length up to 105-in. (standard) or 20-ft. (on special arrangement). Continuous castings come in either cored bar stock or solid bar. A brochure published to tell you all about each type includes tables on sizes and approximate weights.

17

### What there is to know about automatic welders and positioners

A bulletin offered by *The Sight Feed Generator Co.* discusses thoroughly facts concerning Rexarc automatic welder and positioners—from power requirements through main control unit and positioners. There is a fine section of photographs followed by price schedules for welders and positioners and for welding wire.

18

### Fully crowned teeth in power transmission couplings

Seven major engineering advantages of fully crowned teeth in gear type flexible couplings are described in a bulletin just issued by *American Flexible Coupling Co.* Applications of Amerigear couplings for solution of power transmission problems such as excessive offset or angular misalignment, space limitations, high speeds and torque loads are described and illustrated. (1052)

19

### Thermoid multiple V and FHP belts . . .

. . . is a new 8-page, 4-color booklet on V-belts for industial use. Bulletin, available from *Thermoid Co.*, features simplified conversion tables which enable user to determine, more quickly than ever, correct belt for his industrial requirements. Prices, dimensions, weights and construction details are presented. (3787)

**Spring fashions for '53** . . . Paris may point up the bustle or bodice—but California spring styles have been consistent pace-setters since '23. Any size, any style, any wire. There's a California spring to support anything from a strapless pea-jacket to a stamping press. Why not give us a ring—for a new look at the springs we've been fashioning best for the west for so long?

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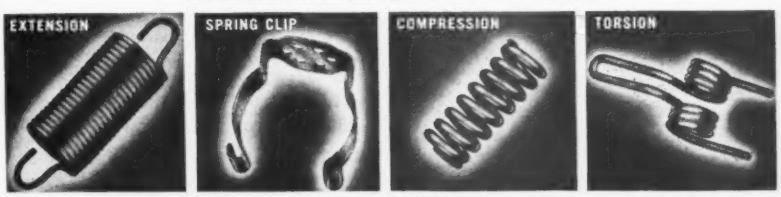


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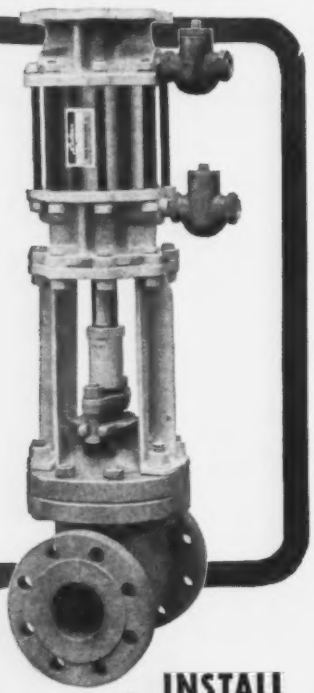

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*Ledeen Mfg. Co.*
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20

### Shell molding process described

New shell molding process for producing stainless alloy castings, just introduced on West Coast by *Solar Aircraft Co.*, is described in firm's booklet. Solar's stainless alloy foundry, which until recently produced alloy castings exclusively for Solar use, now is accepting orders from industrial and aircraft firms, and its capabilities are described in booklet.

21

### Keeping up with Arizona week by week

"Business Trends in Arizona" is a weekly digest of state-wide business and industrial conditions published by *First National Bank of Arizona*. It includes information on state economy —agriculture, oil, manufacturing and construction-wise in a manner which makes it an excellent newsletter.

22

### Simple recorder controller given in new bulletin

Showing typical applications in food, textile, metal and ceramic industries, a 16-page publication issued by *The Foxboro Co.* discusses each unit of a pneumatic control system, from measuring element to control valve. A section of installation diagrams and text is devoted to on-off and proportional control—explains how to select appropriate controller action to match demands of progress. (456)

23

### New edition of industrial temperature control guide

*Partlow Corp.* publishes a new edition of its "The Design and Process Engineers Guide to Industrial Temperature Measurement and Control." This 24-page, two-color manual presents basic principles of industrial temperature control in practical fashion. Manual discusses: eight ways of responding to temperature; five ways of putting that response to work; and nine basic Partlow instrument types. It then takes up evaluation of systems and important considerations in application engineering. (101)

24

### Honeywell instrumentation data sheet

This data sheet describes Ametron electronic scale which employs servo technique for industrial weighing utilizing Minneapolis-Honeywell Brown components and instruments. It explains operation and application of equipment for cranes, platforms, railroad tracks—gives tonnage capacity of various units and shows diagrammatically how they can be employed. Released by *Minneapolis-Honeywell Regulator Co.* Illustrated. (10.18-2)

25

### How carbon and air can cut metals

How to gouge and cut all metals with only carbon arc and compressed air is described in a new bulletin on Arcair Torch. Literature, published by *Arcair Co.*, illustrates typical applications.

26

### Know your multi-unit control centers

A 28-page bulletin, featuring Multi-unit control centers, contains a complete explanation—from their purpose to their construction. Included are unit dimensions and ratings, and some typical applications. An informative feature is "Pattern for Planning a Control Center." Lay-out charts and floor arrangements are illustrated to simplify planning. Published by *Allen-Bradley Co.* (798)

27

### Concerning "wide range" furnaces

*Industrial Systems, Inc.'s* bulletin will tell you all about its Therm-O-Flo furnaces with comments on: furnace casing, door, door lifting mechanism, lining, hearth, openings, heating system, controls, painting, shipment, and special cases. A chart of dimension data, diagrammatically illustrated, is included. (F-104)

28

### Field reports on savings in freight car handling

How Trackmobile users can achieve savings of as much as $11,500 yearly plus a variety of additional benefits in freight car handling is told in "Reports from the Field on Trackmobile Savings and Advantages," published by *Whiting Corp.* (T-109)

29

### Information on industrial casters and wheels

Now available is *Buffalo Caster & Wheel Corp.'s* new 16-page catalog BC-53 which covers firm's entire line of industrial casters and wheels.

30

### Typical taps are typed and tabulated

*DoAll Co.* releases a 16-page booklet listing its line of quality taps. Types covered include hand, machine screw, nut, pulley, pipe, tapper and hook taps. Each kind is illustrated and charts give complete ordering information in convenient form.

31

### Learn about air handling, cleaning and conditioning

Here, in a nicely put-together 58 pages, *Westinghouse Sturtevant division* has condensed and gathered information to help you put air to work with equipment best suited to your requirements. Each section—products, applications, and catalog—comes complete with its own index to help you find your way around the many diagrams, charts, tables and photographs. (600)

32

### The "works" about Ledeen valves

Here is a 16-page, two-color bulletin that describes and illustrates complete line of Ledeen valves. Booklet includes illustrations, operating and circuit diagrams, and dimensions and weights. These valves are used for operating air and hydraulic cylinders, single and double acting, and air motors. *Ledeen Manufacturing Co.* (1000)

33

### For continuous "hi-speed" production

An attractive 16-page, green and black bulletin tells and *shows* you about Standard Conveyor installations and pneumatic tube systems in munition plants, steel and brass mills, foundries, airplane plants, automobile factories, and machine shops. *Standard Conveyor Co.* (68)

34

### A miniature on forged steel fittings

In a vest-pocket-sized booklet, *Watson-Stillman* gives a brief run-down on forged steel fittings, jacks, pumps, pipe benders and wire rope shears. Back page refers you to bulletins giving more detail on each specific subject.

35

### Comprehensive booklet on rubberized abrasives

A new 8-page booklet, from *Cratex Manufacturing Co.*, presents adaptability, versatility and application of company's rubberized abrasives. A complete rundown of specifications and prices is included. (53)

36

### Facts on steel tubing

Two data sheets on square and round structural steel tubing are available from *Drake Steel Supply Co.* These publications deal with method of manufacture, tolerances and size and twist, suggested use in industry, approximate physical properties, and specifications.

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609 Mission Street

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1. For your free copies of **HELPFUL LITERATURE** reviewed in this issue, circle appropriate key numbers.
2. For more information on **NEW MATERIALS AND EQUIPMENT** previewed on following pages, circle key numbers.
3. For complete information on **PRODUCTS ADVERTISED** in this issue, fill in page number and name of advertiser.

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| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
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| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
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**37**

### Specs on new type needle valves

Specifications and dimensions of *The Lunkenheimer Company's* new gland-type needle valves are described in a new, two-color illustrated circular. These precision needle valves are applicable to instrument lines, orifice meters, gauges, by-passes and many other functions where accuracy of flow is required.

**38**

### "A billion dollars in sunshine"

. . . is catch line on a thick brochure, put out by *Kern County Board of Trade,* which will introduce you by words, pictures and color to Bakersfield, Calif., area. It goes into living, recreation, industries, industrial sites. For those who are statistically minded, it rounds out the whole thing with a comprehensive spread of statistical tables of concern to businesses.

**39**

### Learn about non-plugging flexible valves

A new 24-page brochure in color from *Farris Flexible Valve Corp.* describes in interesting detail company's complete line of pinch-type non-plugging flexible valves. Contents include advantages, uses, types, installation diagrams and pointers, flow characteristics, corrosion and abrasion selection recommendations, maintenance instructions, and specification sheet. (No. FL382)

**40**

### For handy selection of materials handling equipment

A pocket size catalog from *Colson Equipment & Supply Co.* illustrates, describes and prices 78 kinds of most popular hand trucks and equipment as well as fifty types and kinds of casters and wheels. This condensed publication will store easily for both present and future reference.

**41**

### Hose coupling information

*Hose Accessories Co.* presents a bulletin describing six types of hose couplings and fittings. These fittings are designed for air, water, gas, oil, hydraulic or steam lines, and feature rapid coupling and uncoupling. (6500)

**42**

### Axle facts

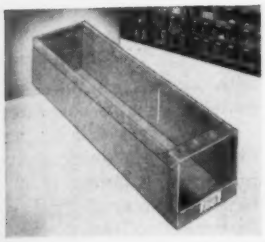
*S. H. Edwards, Inc.,* condenses into one page facts and figures on its torkspring axle, types "T" and "A." A dimension chart shows capacity by tons, maximum body width and spindle size. Photographs show some of this device's applicable uses.

***USE RIP-OUT POSTCARD for more information on products introduced this month.***

# NEW MATERIALS & EQUIPMENT

43

## Bin-boxes save inventory time and money



"Chem-Board" bin boxes, made of chemically hardened corrugated board, save cost of bin dividers and have a riser front to increase capacity. Now, instead of scooping out contents of bin at inventory time, entire box is easily pulled out and weighed. In moving, rigidity, dimensions and handling ease of these boxes permit cross stacking for quick transfer by pallet. They come in sizes for 36- and 24-in. deep shelving. *Convoy, Inc.*

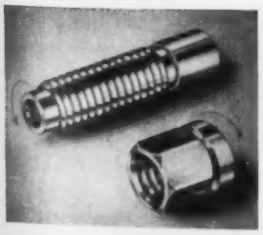
44

## Cut off saw specializes in chewing channel iron

Wise Abrasive Cut Off Saw cuts dry using both an 18-in. or 20-in. wheel. It specializes in cutting channel iron, pipe, bar stock, wire rope, etc. A swivel head allows wheel to rotate 45 deg. to left. Wheel guard automatically adjusts itself to offer maximum protection for operator at all times. It is available with either a 7½- or 10-hp. motor and has a #2 Allen-Bradley magnetic starter. *Henry H. Wise Co.*

45

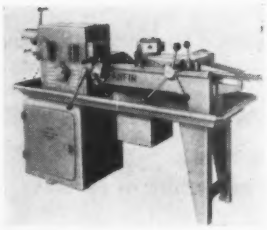
## Positive holding and unmarred surfaces with this swivel-shoe set



Here is a new, low cost swivel-shoe set which is simple to use and adaptable to any type of tool, jig or fixture. It is said to provide positive holding without marring, scratching, or burring the part that is held. It eliminates high cost of making shoes on the job and time-consuming mounting of plates and fixture shoes so that home-made shoes can be properly mounted and riveted. *Allied Air Parts.*

46

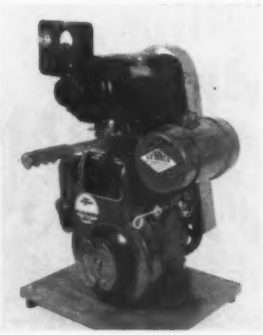
## High production with this turret lathe



"Anfin" is designed as an operator's turret lathe to give free swinging tooling operations and high production. Equipped with Warner magnetic clutch and spindle brake control, instantly high or low spindle speed is obtained by pushing a button. Another feature is 16-in. power turret travel, saddle type. *Montague-Harris & Co.*

47

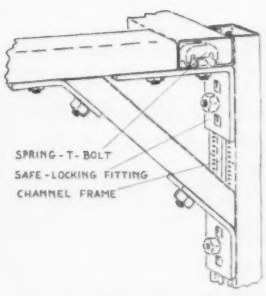
## Convenient, portable engine generator plant



Lynnco Powerhouse is a simplified low-cost portable gasoline-engine electric generating plant with a maximum output of 3,000 watts, and a continuous rating of 2,000 watts, 115 volts, single phase, 60 cycles. Complete plant weighs about 150 lbs. Generator can be removed in less than a minute and reassembled in same amount of time. Plant is designed to fill electrical needs of contractors, farmers, house trailers, civil defense units, airports. *Lynn Engineering & Supply Co.*

48

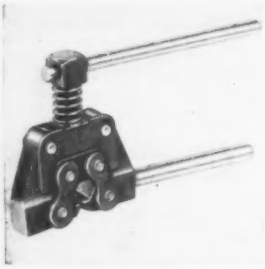
## Man-sized erector set is new development in framing material




Steel Mult-A-Frame is a new way of building metal frames and supports for numerous applications. With it you can, in your own plant and with non-skilled labor, construct racks and shelving, supports and fixtures that are said to be completely adjustable and re-usable. A free sample kit contains actual piece of channel frame, safe-locking fitting and spring-T-bolt and nut to help you visualize applications. *Enterprise Commercial Company.*

49

### Chain breaker-upper



Chain Breaking Tool, CBT60, will disconnect any pitch roller chain made according to specifications of American Chain Manufacturers Association from ¼-in. pitch up to and including ¾-in. pitch. Roller link is inserted between jaws of tool, adjustable lever is turned which forces pressing tip to push pin through pin link plate. Process is repeated on pin at other end, and chain is then disconnected. *Boston Gear Works.*

50

### Portable unit reconditions oils while in service

Model "M" portable filter units are designed to meet demand for better equipment maintenance and reduction of production costs where oils and solvents are major factors. Among mentioned advantages are extension of oil and solvent service life and reduction in new oil and solvent inventories by reclamation while in or out of service. Unit comes 12 x 12-in. wide and 36 in. high. It weighs 107 lbs., and has a ⅓-hp., 115-v. motor. *Mayhew Products Co.*

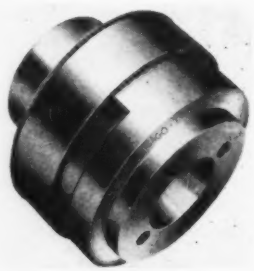
51

### Blind-hole tapping lubricant developed by Destiny

"Hypertap," extruded in solid stick form, is intended to assist in tapping of threads in holes which do not entirely pierce through metal or plastic parts. It is said to eliminate tapping operations preliminary to bottoming by its automatic-hydraulic removal of chips from hole during thread-cutting operation. Benefits include clean cut threads, longer tool life and reduced tap breakage. *Destiny Products Co.*

52

### Flexible couplings crawl into flywheel



Lovejoy Type C coupling with one hub cut off is the newest thing in couplings. Three or more holes are tapped in remaining flange by which coupling is fastened to center of flywheel. By "crawling" into flywheel, this modified coupling not only saves space normally taken by conventional hub-length, but also saves costs by eliminating flange. *Lovejoy Flexible Coupling Co.*


# NOPAK Cylinder *Saves 92* HAND TURNS

## — in opening or closing 24" Wedge-Gate Fabri-Valve

**Many installations of Wedge-Gate and Bonnet-Stock Valves are activated by NOPAK Cylinders for faster, more efficient operation. For example, a NOPAK 10" Model "D" Water Hydraulic Cylinder will open or close a 24" Wedge-Gate Valve, as pictured, in a few seconds. If manually operated, these 24" valves require 92 full turns of a handwheel for each opening or closing . . . consuming many minutes of costly manual labor.**

**The Fabri-Valve Co., Portland, Ore., states that these valves handle vapor from 50 p.s.i. to 150 p.s.i. Such valves are also used in liquor control lines, in paper mills, and as sea chests aboard many types of merchant ships. NOPAK Cylinders, controlled by NOPAK all-bronze 4-way valves, are used as activators because of their uniformity in design, adaptability to various types of Fabri-Valves, and their ease of installation.**

**You can gain these and other benefits in specifying NOPAK Cylinders and Valves for the efficient application and control of air or fluid power.**

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Refer to Sweet's File for Product Designers or write for Bulletin SW-1.

•

*Representatives in Principal Cities*

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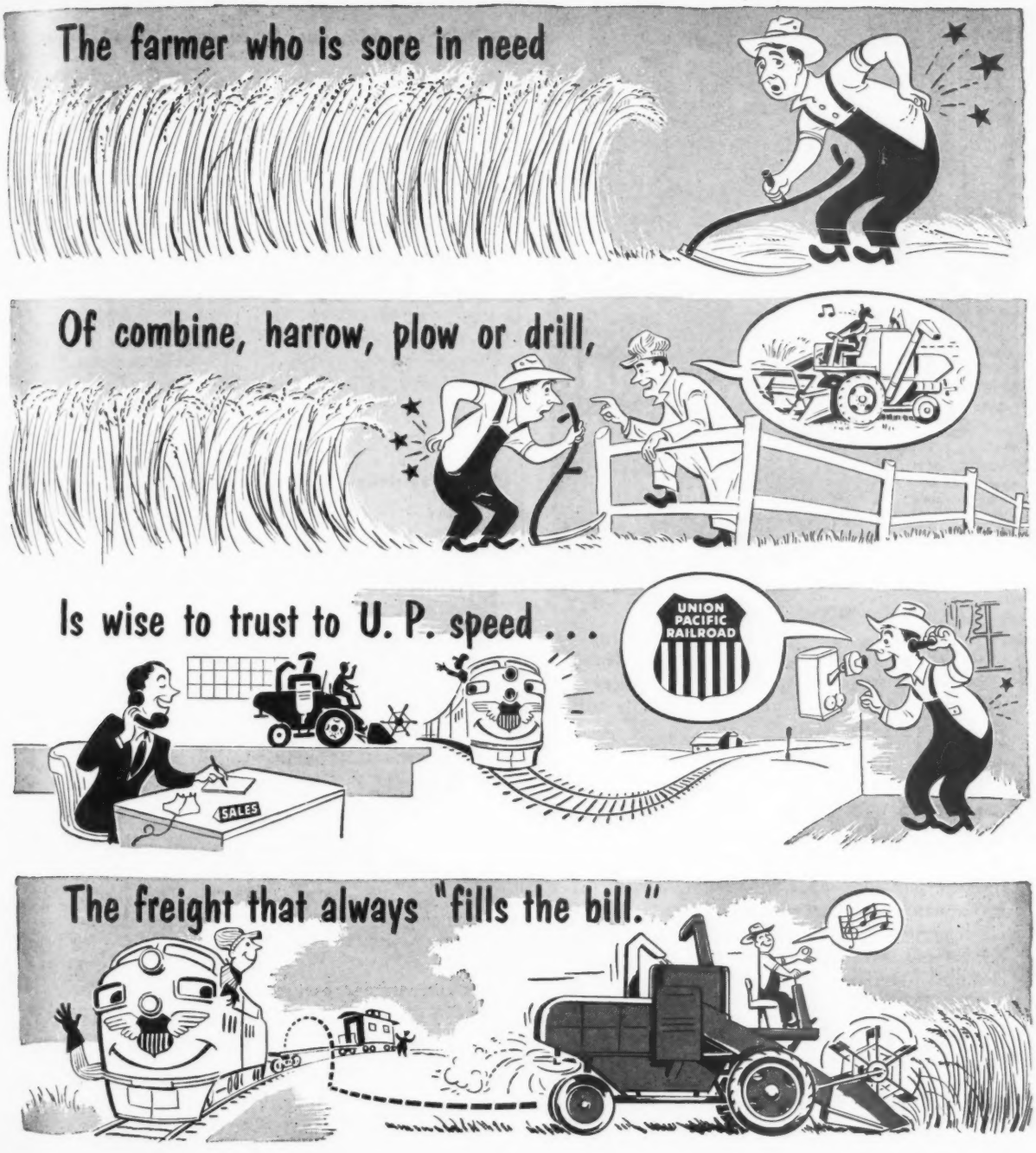
**VALVES AND CYLINDERS**

**DESIGNED for AIR and HYDRAULIC SERVICE**

NOPAK Cylinders are used to activate various types and sizes of Fabri-Valves up to 24" in diameter.

A 7277-½H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Of combine, harrow, plow or drill,
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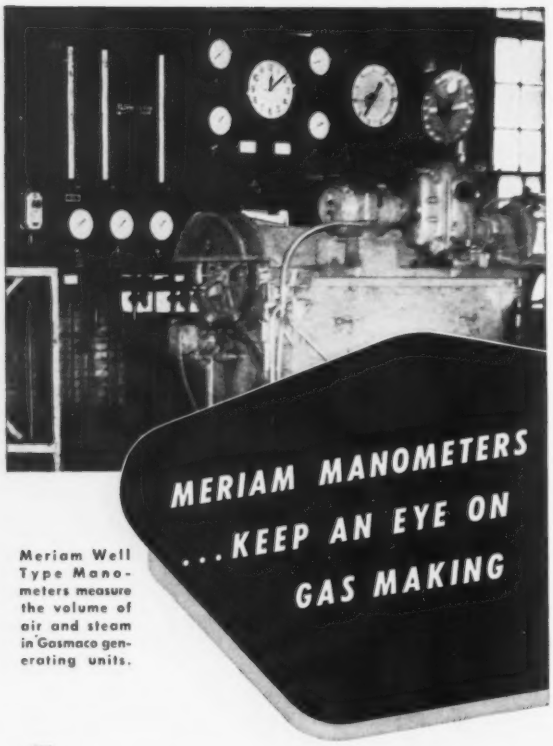


Meriam Well Type Manometers measure the volume of air and steam in Gasmaco generating units.

IN the booming artificial gas industry, Meriam Manometers answer vital problems of measurement accurately, dependably, and at reasonable cost.

The Gas Machinery Company, Cleveland, Ohio, one of the outstanding manufacturers of industrial furnaces and machinery for generating artificial gas, depends upon primary standard instrumentation in its oil gas generating units.

The normal four minute cycle demands accurate measurement of a specific volume of air for introduction with fuel oil to the heated oil spray chamber. Concluding this cycle is an equally critical measurement of steam—required to purge chambers. Meriam Instruments have been used successfully in Gasmaco units for many years.

If you have a problem in measuring liquids or gases, flows or pressures, you can rely on Meriam Instruments. For more than 40 years, Meriam Instruments have answered countless problems. We are glad to share our experience with you. Write today, or call your Meriam Representative.

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MANOMETERS, METERS AND GAUGES FOR THE ACCURATE MEASUREMENT OF PRESSURES, VACUUMS AND FLOWS OF LIQUIDS AND GASES

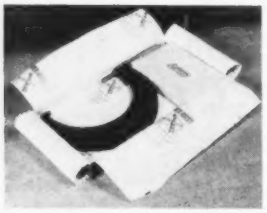

53

## Order assembly cart features bayonet pin

An order assembly cart for grocery, hardware, department store and industrial warehouses features a bayonet pin, which, when lowered, engages recessed floor chain conveyors for automatic transfer to shipping departments. Two shelves, each 25 in. by 42 in., provides storage for selected orders and bulky items. Check-off writing surface is provided for order picking records. *Equipment Manufacturing, Inc.*

54

## Rust-free delivery of metal products



Nox-Rust vapor wrapper is a special packaging paper impregnated with Callex, a volatile corrosion inhibitor. It is now acceptable for military packaging in conformance with specification MIL-P-3420. Use eliminates need for grease-type rust preventive coatings. Wrapper offers quick effectiveness, long protective life, stability under wide temperature variations, non-toxicity and absence of disagreeable odors. It is available in a variety of easily conforming grades for many applications. *The J. W. Guthrie Co.*

55

## This vibrating screen processes food efficiently

Vibro-Clean Screen is designed for effective removal of foreign matter from vegetables and for rapid dewatering without damage to product. Fast, even flow of material is produced by a two-bearing, unbalanced-weight vibrator operating at 1,800 rpm. Uniform, high-intensity motion is transmitted to entire screen deck, preventing blinding and clogging of screen cloth and causing discharged material to form an even bed for inspection. Adjustments are made quickly for different capacities. Screen has no ledges or pockets to cause bacteriological buildup. *Link-Belt Co.*

56

### Light trolley conveyor for dependable overhead service

"Chainveyor" is a light-duty, fully enclosed, continuous chain conveyor with no complicated wearing parts. Flexible short radius curves and straight tubular track sections are easily installed. Existing applications extend to food processing, sheet metal, aircraft, furniture and steel fabricating industries. *Mathews Conveyor Co.*

57

### Stainless steel fittings feature Butyl rubber seals

"Quikupl" stainless steel fittings with Butyl rubber seals are now available. According to firm, Butyl seals permit use of Quikupl installations in a greater variety of corrosive conditions and services than is now possible. They will be particularly effective in sulfuric, hydrochloric, phosphoric and acetic acids; also in alkalis and hypochlorites. *The Cooper Alloy Foundry Co.*

58

### Torque-limiting wrench releases automatically

Proto precision torque-limiting wrench is suited for nut and bolt torquing by almost all types of industries. It features four characteristics as outstanding. First, it releases automatically at proper setting and does not require dials, pointers, etc. Second, it employs a fully enclosed precision spring under compression as principal torque-controlling element. Also, it uses an accurate micrometer-type adjustment. Models with a built-in reversible ratchet head are available, that do work of both a ratchet and torque wrench. *Plomb Tool Co.*

59

### Scrub your floors the easy way

Tornado floor scrubbing machine is designed to speed floor cleaning as well as to reduce operator fatigue. New brush coupling device permits operator to move machine over brush, start motor and engagement becomes automatic. Tipping machine and a nudging slightly will remove brush immediately. Dual motor switches allow motor to be operated by either right or left hand. Length of handle may be easily adjusted to suit physical size of all operators. *Breuer Electric Manufacturing Co.*

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March 23

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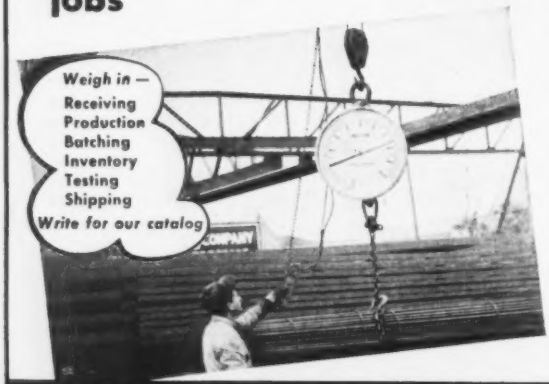
36 MODELS, 500 to 200,000 LBS.

HYDROSCALE

reduces the effort and expense associated with routine weighing jobs

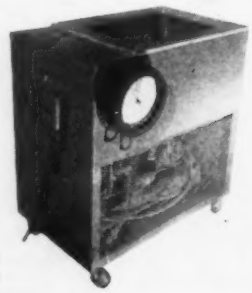



HYDROWAY SCALES, INC.

20618 West 8 Mile Road, P. O. Box 4754, Detroit 19, Mich.


60

## Constant temperature control bath machine



Combination of a refrigeration and an electrical heating system in this machine serves to maintain any desired temperature within ¼ deg. F. maximum variation. This is sufficiently accurate to deal with .001-in. tolerances in cylindrical aluminum parts. Where close tolerances are required, it is said that this machine will save dollars in production time and end part rejection headaches. *Service Metal Fabricators Co.*

61

## Band saw for hard-to-machine alloys

Made from a red-hardness high speed steel, several types of Milford Rezistor high speed band saw blades are designed for production cut-off work and are particularly effective for cutting stainless steel. Since not all current types of band saw machines are suited for use of this high speed steel blade, it will be introduced on a rental performance basis under control of manufacturer. At present, sizes are confined to ¾-in. and 1-in. widths with 6 teeth per inch, in tempers suitable for specific applications. *Henry G. Thompson & Son Co.*

62

## Retractable live roller boom conveyor

An unusual application permits this boom conveyor to be extended across a railroad siding between two buildings—and allows it to be withdrawn, permitting passage of freight cars. Live roller boom is equipped with a fully enclosed drive mechanism and entire mechanism is a self-contained unit. *Alvey Conveyor Manufacturing Co.*

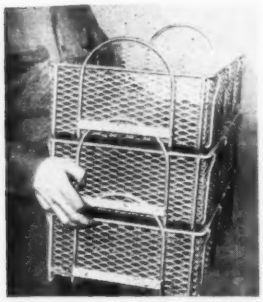
63

## This heavy duty drill is lightweight and compact

Constructed for heavy duty operations with maximum power on continuous runs, new Mall PD-304P pneumatic drill is lightweight and compact in design. Contoured pistol grip, trigger throttle and built-in speed regulator combine for easy, efficient handling. Drill has own built-in oiler, and all moving parts glide on precision ball bearings. It weighs only three lbs. *Mall Tool Co.*

64

### Expanded baskets for small parts



For manufacturers who have problems with bulk handling of small parts or in-process storage, these expanded metal baskets should prove a boon. Called "Eezy Stak," they are made of sturdy steel frames welded to one-piece, pre-formed, expanded metal panels. They stack, one on top of another, have comfortable handles for lifting or hand carrying, and are zinc plated for protection against rust. Baskets come in ¼- and ½-in. mesh sizes. *Wheeling Corrugating Co.*

65

### There's wax in this new water-type coolant

"Johnson's #130 Wax-Cool" is made for use in metalworking machines that use water-soluble coolants. Tests indicate characteristics of exceptional lubricating properties and minimization of heat at its source. Product thus extends tool life and provides a better finish on metals. Sold as a concentrate, Wax-Cool is packaged in 30- and 55-gal. drums. Should be mixed with 20 parts water before use. *S. C. Johnson & Son, Inc.*

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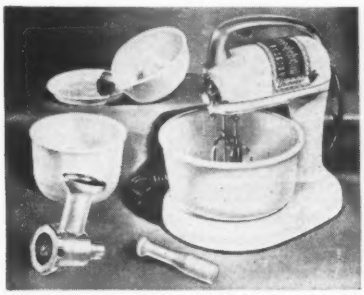
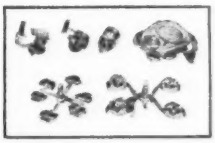


**used to produce DORMEYER**
**first name in mixers**



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. . . The new Dormeyer Power-Chef performs all! To produce the die cast parts of this famous food-fixer demanded equipment of equal versatility and precision . . . And KUX, First Name in Die Casting Machines "delivered the goods" to perfection!

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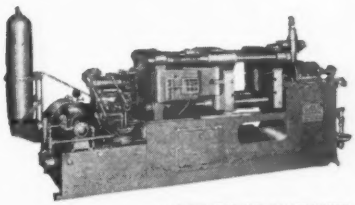

MODEL **BH-30** ILLUSTRATED

Hydraulically operated die casting machine for production of zinc castings weighing up to 10 pounds.

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66

### Precise weight recording eliminates human error

Detecto weight printer scale puts all weighing records in print and is a dependable means of stopping losses before they can occur. Opportunity for human error in reading dial chart or in recording that reading is nonexistent. No special knowledge is needed to operate unit, and a wide range of ticket sizes printable. One original and three copies are printed in 1½ seconds. Standard service is on 110 volts, 60 cycle, single phase, AC, but units can be furnished for operation on other current characteristics. *Detecto Scales, Inc.*

67

### Both hands freed with light-weight strapping unit

A complete strapping unit, weighing only 10 lb., 10 oz., fastens around waist by a belt and is designed to carry strapping tools and seals to difficult or distant points. Portability and accessibility of all equipment enables worker to do job quickly and efficiently. *A. J. Gerrard and Co.*

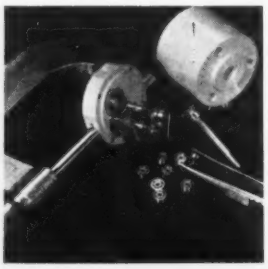
68

### Single tone selective signaling system

Motorola's new selectivity signaling system is composed of a 10-button selector box, single tone oscillator, three frequency switch kit, and single tone decoder. It is designed for use in conjunction with any communication medium—anywhere that remote control or receiver selection is necessary. System has widespread applications in industrial, public safety, transportation and utility communications. *Motorola, Inc.*

69

### Miniature ball bearing gear boxes used in computer unit



A combined computer and functional switching control unit for aerial reconnaissance cameras uses over a dozen miniature gear boxes with six or eight "Micro" ball bearings. These boxes (shown here) measure only 1-in. O.D. by 1¼ in. overall. Class 5 stock Micro ball bearings are used which meet exacting requirements of a frictionless and nonbacklash gear train within specified space limitations. *Bill Jack Scientific Instrument Co.*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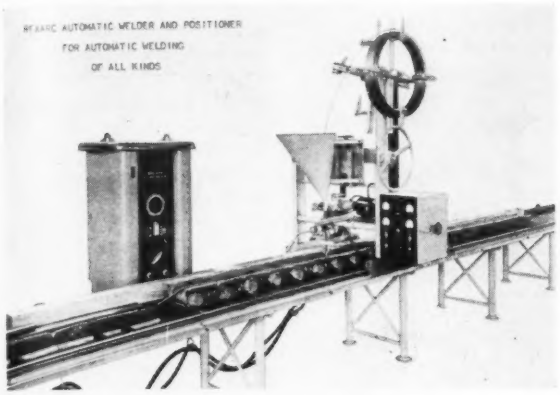
70

## Automatic replacement of many hand welding operations




Rexarc Automatic Welder is designed to replace by automatic procedure, large numbers of welding operations previously done by hand. Some features include: provision for both high and low voltage welding; high frequency starting and stabilization; and control over low arc voltage and amperage. Welding can be lineal or cross-bead on flat or circular shapes, continuous or in sequence. Removable head is transferable from one position to another. *Dean Weld Machine, Inc.*

71

## Special tacker for hard-to-get-at places

A special model stapling tacker, T5 Outward-Clinch, now makes it possible to drive and clinch staples in places where a blade cannot be inserted to accomplish job. Tacker automatically drives staples and turns legs outward to clinch under or inside work. Machine can be used anywhere, no matter how far in from an edge, thus speeding up and simplifying many fastening operations. *Bostitch.*

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72

## Pneumatic transmitters are getting smaller

Here is a miniature pneumatic transmitter for measuring and sending readings of temperature, pressure, vacuum, differential pressure, and liquid level, to recording, indicating, and controlling receivers. Transmission is by means of air pressures of between 3 and 15 psi. that have a direct relation to measured quantity. Series 650 pneumatic transmitter weighs 7½ lbs., is weatherproof and can be installed in any location. Will operate in any position. *The Bristol Co.*

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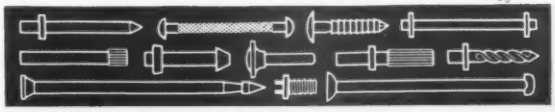

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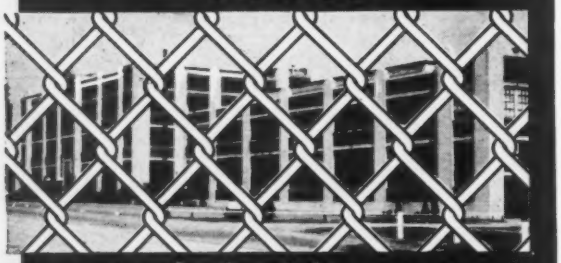

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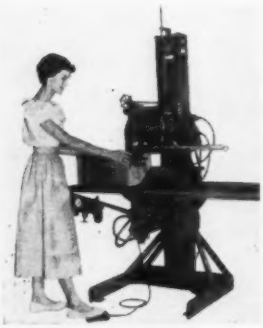
73

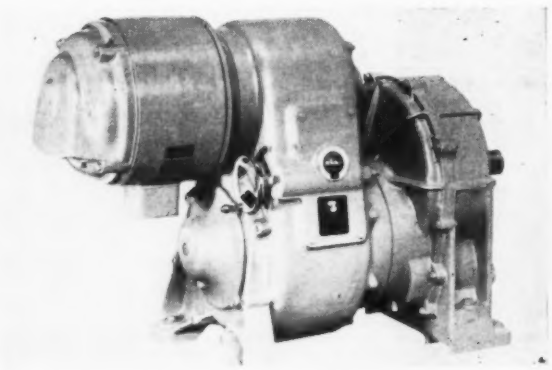
## Close 350 cartons per hour with this staple machine



"Staple King" is a new production model of air-operated, retractable anvil stapling machines designed for simultaneous closing of tops and bottoms of center slotted cartons and partial or full overlap cartons—either corrugated or fibre at rate of over 350 an hour. Patented retractable anvil feature of this stapler permits closure from outside, after cartons are filled with goods. Machine automatically accommodates cartons that vary in height up to 5½ in. A simple adjustment sets machine when variance is greater. *International Staple & Machine Co.*

74

## Heavy-duty variable speed drive



KFEB double reduction 20- and 25-hp. Speed-Trols answer a growing demand for rugged, self-contained heavy duty electric power drives providing infinite variable speed in low speed ranges. The 20-hp. type 364 KFEB is available with maximum speeds ranging from 176 rpm. to 42 rpm. The 25-hp. type 365 KFEB has maximum speeds ranging from 176 rpm. to 64 rpm. Drip-proof and splash-proof models feature direct-through ventilation system. *Sterling Electric Motors, Inc.*

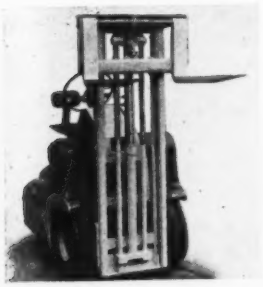
75

## Continuous-cast bronze cut to your measure

When you buy continuous-cast copper alloy rods, tubes and shapes, your product is cut precisely to your requirements in length up to 12 ft. (standard) or 20 ft. (on special arrangement). This enables you to buy and handle fewer lbs. of metal and eliminates necessity to include allowances for metal rejects—scheduling is simplified. Improved uniformity and machinability of these castings offer an additional saving. Superior physical properties assure a better end-product. *Kingwell Brothers, Ltd.*

76

### Low overhead clearance no problem with freelift accessory



Stacking inside a freight car, truck van, under balconies or other low overhead clearance spots can now be done with a power lift truck equipped with Hi Duty Freelift accessory. It is designed to fit all Hi Duty fork lift trucks and is now available as added equipment. Being entirely hydraulic, it does not require usual array of chains and sprockets, thus maintaining maximum visibility. *Transitier Truck Co.*

77

### V-belt pump for viscous liquids

A new multiple V-belt drive pump unit for handling heavy fuel oils, etc., features wide flexibility. Unit's advantages include: simplified motor mounting for motors up to 5 hp.; one point belt tension adjustment; ball-bearing pillow blocks to carry weight of pulley and take side pull of belts; pump and jack direct-connected by flexible coupling. A wide range of pump models and capacities available. *Tuthill Pump Co.*

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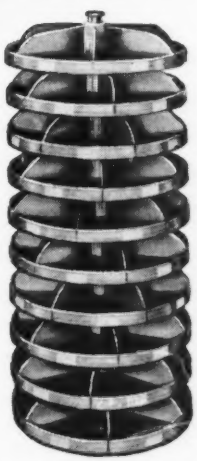

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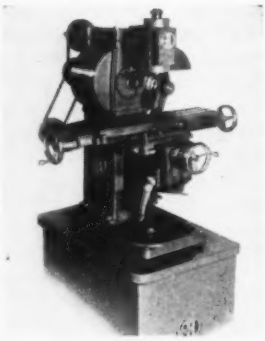
78

## A sturdy bench mill for heavy work



This is a compact bench mill of such unusually sturdy design and great rigidity that it accomplishes heavy work ordinarily requiring larger, expensive mills. Work requiring a 12-in. long, 9-in. vertical and 5-in. traverse travel can be readily done on its 5-in. by 20-in. surface. Milling of table T slots from solid insures inflexible anchoring of work itself. Work is power fed at .003, .006 or .012 per spindle revolution. ½-hp. motor recommended. *Rotex Punch Co.*

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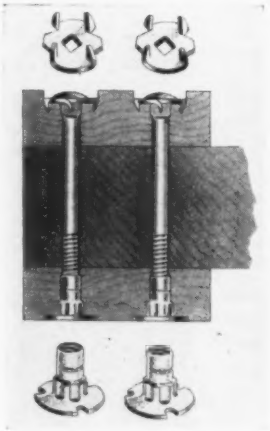
79

## Positive displacement for pressures to 500 psi.

Dudley V-9 is a positive displacement type pump for water, brine, oil, gasoline and chemicals. Model 100 delivers from 2.4 gpm. to 7.2 gpm. at pressures from 9 psi. to 433 psi., depending upon speed of operation and applied power. Nine sleeves extend into each of two cylinder blocks whose angular relation to each other causes a telescoping cylinder effect when blocks are rotated. No lubrication required. There are only 12 moving parts and total pump assembly is comprised of 15 parts. Weight, with bronze body, is five lbs., with aluminum body, 2½ lbs. *Eastman Pacific Co.*

80

## Teenuts and torque washers



Teenuts are a combined nut, plain washer and lock washer. In bolted industrial products such as pallets, pallet bins, crates, trusses, etc., one drilling operation is sufficient. Torque washers are designed to prevent turning of bolt when removal is necessary. Combination of carriage bolt, torque washer and teenut makes a highly efficient and speedy operation, both in assembly and dismantling. *Frank L. Robinson Co.*

81

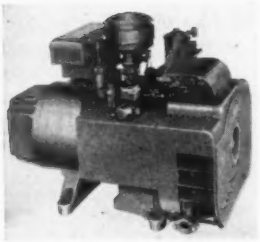
## New concept in lubrication

With Molub-Alloy, petroleum is used as a vehicle rather than as a primary lubricating agent. It carries evenly spaced molecules of solid to surfaces to be lubricated and pro-

tected. Each molecule consists of a layer of sulphur atoms combined with a layer of metallic alloy atoms. The first variety adheres to surface and holds up metal alloy atoms to form a metallic lubricant that will take wear and tear. It comes in a complete range of vehicles for all purposes: grease; oils; outside gear lubricant; spindle oils. *Imperial Oil & Grease Co., Inc.*

82

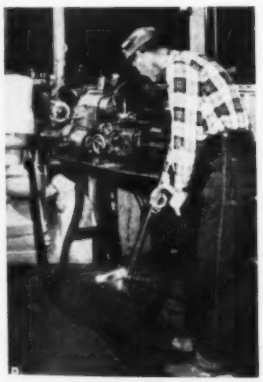
### Air-cooled, low-cost electric plant



This gasoline-powered electric generating plant's new, highly efficient vacuum cooling system employs a powerful centrifugal blower which draws cold air through generator and over engine. At same time, heated air is discharged from an 8-in. by 12-in. side vent. "CW" model is now being mass-produced in 5,000-watt and 10,000-watt capacities. Among its claimed advantages are: low initial cost per kilowatt of power; lower operating cost; increased durability plus high output; and simplicity of installation. *D. W. Onan & Sons, Inc.*

83

### Maintenance machine does 3-way job



According to company, Wilshire 3-way Maintainer not only sweeps mechanically 6 to 15 times faster than a man with a broom, but also provides a suction system for picking up dust and dirt in out-of-the-way places as well as a blower system for blowing down dust from machines and other equipment—this dust being picked up by suction system. *Wilshire Power Sweeper Co.*

84

### Active-solvent coatings applied safely with this sealer

Prufcoat Sealer P-25M opens up a vast field of application possibilities for vinyl and other heavy-duty protective coatings. Made of selected synthetic resins and a special combination of leafing-type metallic pigments, it air-dries by evaporation of volatile solvents having a minimum effect on conventional oil paints, asphalt coatings, etc. It thus forms an effective barrier film over surfaces which might otherwise be lifted or wrinkled by active solvents. In addition, this product may be used as an anti-staining sealer over materials such as tar, oils, and pitch. *Prufcoat Laboratories, Inc.*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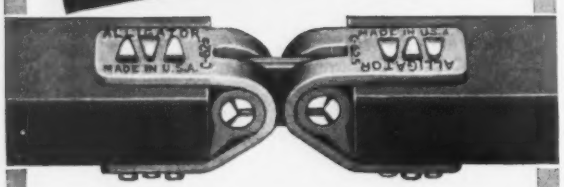


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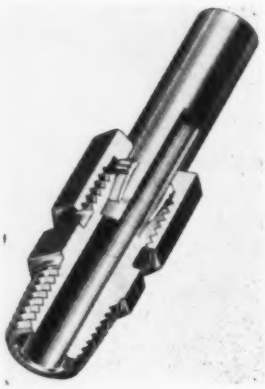
85

### Positive seal and no special preparation with this tube fitting



Ermeto tube fitting consists of a sleeve, nut, and tapered body. As nut is tightened, sleeve is forced forward into taper of body, leading edge of sleeve contracts, thus forcing cutting edge to shear a slight groove into outer surface of tubing and providing a leak-proof joint between fitting and tube. Disassembly and reassembly can be made without loss of sealing quality. For use wherever metal tubing transfers liquids or gases. Available in carbon and stainless steels. *The Weatherhead Company.*

86

### Great power versatility with new multi-speed motor

Here is a single unit that can be operated at different speeds to fit needs of special jobs. Available in 2, 3 or 4-speed ratings in these torque-horsepower-speed combinations: constant torque; variable torque; constant horsepower. Motor sizes range from ½ hp. to 150 hp. *Reuland Electric Co.*

*Use rip-out postcard for more information*

87

### New electrode holder for long service and cool operation

Cooltong is a 400-ampere insulated electrode holder with a nose made of copper core between four and six layers of laminated, glass-impregnated plastic cloth. In addition to acting as reinforcement, this construction dissipates heat so that it will not concentrate in nose and cause deterioration in insulation. Jaws will handle electrodes from ⅛ to 5/16 in., and have a wide opening to permit fast release of stubs. Holder handle is perforated with large holes providing super-ventilation and reducing heat from induced currents when welding with AC. *The Lincoln Electric Co.*

88

### Work positioner is easily portable

A new electrically turned, variable speed, work positioner is offered that incorporates smallness and lightness with portability. It has accessories to make it inclinable and operable intermittently. It is available both as a bench or pedestal model. It will safely carry a load of 300 lbs. and moves at speeds from ¼ rpm. adjustable upward. *All-State Welding Alloys Co., Inc.*

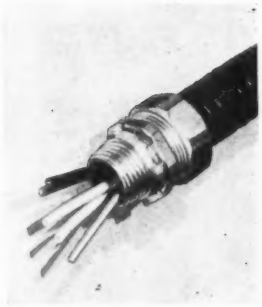
89

### Plastic illuminated ceiling easy to install

Luve-Tile, according to firm, offers many advantages for lighting both commercial buildings and modern homes. Easily installed, unlimited in range of designs, simple to maintain, Luve-Tile is also low in cost. *J. A. Wilson Lighting & Display.*

90

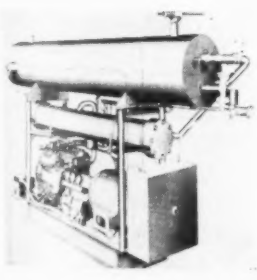
### Electrical conduit is "sealed" against moisture



Tough, extruded synthetic covering over "Sealtite" flexible electrical conduit type UA's metal core protects wiring against moisture, oil, dirt, chemicals, and corrosive fumes—on permanent and temporary installations. Applications of this moisture-proof conduit are suggested by firm, to overcome problems of movement, vibration, and misalignment, both indoors and outdoors. Available in long lengths in nominal electrical ID sizes ⅜- to 1¼-in. inclusive. *The American Brass Company.*

91

### For lowered cost and upkeep of air conditioning systems



This cold generator is designed to provide a single-unit source of large quantities of cold water for air conditioning and refrigeration systems requiring between 10 and 50 tons of cooling. According to company engineers, it requires only simple water and electrical connections and eliminates complex installation and maintenance problems formerly involved in jobs in this range. *The Trane Co.*

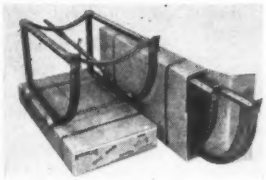
92

### Oil lubricator operates on low air flow

This new and unique (Micro-Fog) lubricator for bearings, spindles, gear boxes, and small air powered devices is designed to produce an extremely fine and uniform oil fog at low air flow. Its outstanding features include a constant oil level to assure a uniform rate of oil feed; 360-deg. visibility of oil flow, and accurate metering of oil delivery into the air line. *C. A. Norgren Co.*

93

### For easier handling and storage of barrel cradles



American Pressed-Steel Barrel Cradles are now packed in individual corrugated cartons. Barrel cradles are "knocked down" for packaging and are shipped with complete instructions so they can be assembled in a matter of minutes. Cartons protect cradles in shipment and are marked on ends for quick identification of contents. *The American Pulley Co.*

94

### Translucent panels for building

Easily installed with ordinary tools, and requiring no special skill for installation, Rippolite translucent paneling is a natural for skylighting in industrial buildings. Product is not affected by weather conditions and, according to company, will not buckle, sag, crack, or warp. Panels are available in a variety of colors, in standard lengths up to 12 ft., and widths up to 4 ft. *Alexander H. Kerr & Co., Inc.*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# THE WEST ON ITS WAY

## ARIZONA

**MORE FOR MAGMA**—Magma Copper Co., New York, issues 10,000 shares of its capital stock to St. Anthony Mining & Development Co., Ltd., in exchange for most of St. Anthony Mining's Tiger, Ariz., properties. These properties adjoin those of San Manuel Copper Corp., wholly-owned subsidiary of Magma already engaged in producing low-grade copper orebody. The St. Anthony Co. halted its business and mining operations in 1952, and since that time has been liquidating and disposing of its properties.

**FINGER WORK SCHEDULED**—Mountain States Telephone and Telegraph Co. plans to spend about $1,000,000 on new equipment for Douglas and Bisbee. Residents in these communities will now have dial phone systems. New building for this equipment now under construction will cost about $155,000.

**THINK IN PHOENIX** — International Business Machines Corp. is considering Phoenix as the site for its Western Division factory. Such a plant would have a 1,000-man payroll.

**COPPER**—About 230,000,000 lb. of copper will be produced from low-grade ore in Arizona under an agreement between Miami Copper Co. of New York and the U. S. government. Copper will come from an underground deposit in the Globe-Miami mining district which the company has been working since 1906. Copper has a guaranteed price per lb. of 27.85 cents. Company will develop new ore body at its own expense, and expects to spend about $3,000,000 for this purpose. Production will start in 1955, and contract will expire in 1962. Company expects this deposit to yield a considerable amount of molybdenum in addition to the copper.

## CALIFORNIA

**PROGRESS FOR PLEXOLITE**—Plexolite Corp., Los Angeles producer of translucent fiberglas-plastic decorative and structural panels, is building a $250,000 factory on a Los Angeles International Airport district site at Maple Ave. near Sepulveda Blvd., El Segundo. Plant, to have 30,000 sq. ft. of building, with railroad siding and ample parking space, will employ 75 persons, and increase firm's production by 75%. The Plexolite Sales Co., general distributors, will take over firm's present plant at 4223 W. Jefferson Blvd., Los Angeles.

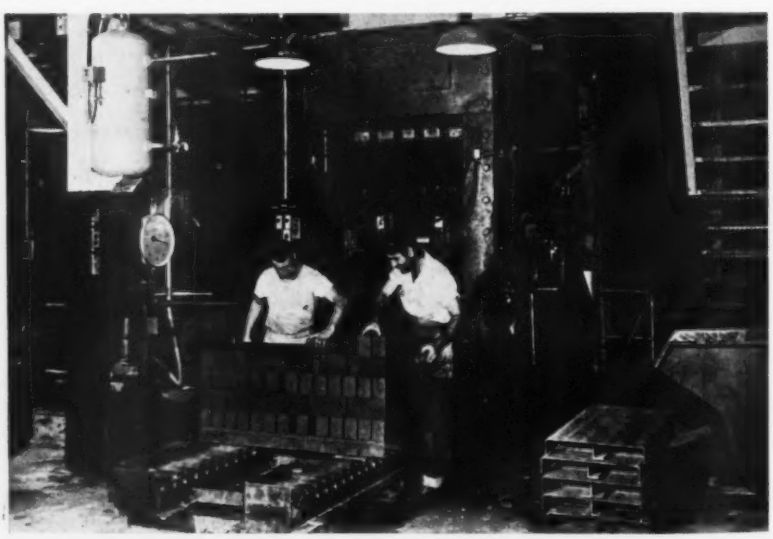
**HAMILTON TO GET CONSTRUCTION**—Hamilton Air Force Base is one of ten air bases scheduled to have new reserve training facilities constructed. A part of the $11,685,000 authorized by the 82nd Congress for this purpose will be used at Hamilton. Construction will include administration, training, maintenance and warehousing facilities; aircraft parking ramps, aviation fuel storage areas; and general aviation utilities buildings.

**TRAM RAIL MOVE**—California Tram Rail Co. moves to new quarters at 1433 Illinois St., San Francisco. New location gives firm 15,000 sq. ft. of undercover space, and facilitates increased production of standard models. It also makes possible production of tram rails of up to 25-ton capacity with 80-ft. span widths.

**AMTRAC TO MARE ISLAND**—Refurbishing work on amphibious tractors being conducted under Navy contract is moved from San Francisco Naval Shipyard at Hunters Point to Mare Island Naval Base at Vallejo. This is being done to clear shops at Hunters Point for the $62,000,000 reconversion job on the aircraft carrier Bonhomme Richard due to start in April or May.

**PIPE PLANT PLANNED**—Basalt Rock Co., Napa, plans to build a new mill for large diameter pipe at Fontana on property purchased from Kaiser Steel Corp. Plant will be erected on a 35-acre site and will produce diameters above the 36-in. maximum of firm's Napa mill. In addition to being a complete pipe mill

**BASIC REFRACTORIES**—Chemically bonded basic refractories are now being manufactured in California by Harbison-Walker, the country's largest producer of refractories. First carload shipments from the company's Warm Springs Works in the Santa Clara Valley were made in September. Plant was purchased early in 1952, and converted from the production of glass tank blocks to the manufacture of basic refractories. Harbison-Walker has another plant in the West, The Northwest Magnesite Co. at Chewelah, Wash. Bulk of magnesite used by both plants comes from deposits in the state of Washington.

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for large diameter pipe, new plant will also form large segments for shipment to Napa plant for welding, testing and finishing. Company will also enter the steel cylinder concrete pipe field.

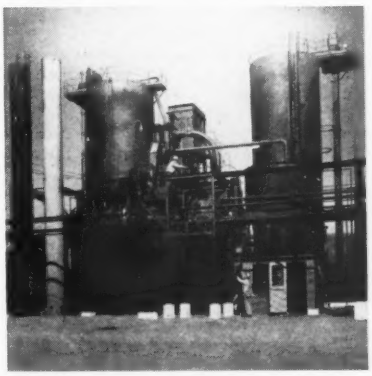
**SHIPPING WITHDRAWAL**—American Hawaiian Steamship Co. will withdraw from intercoastal freight trade. Action is brought about by advancing cost of cargo handling and work slow-downs due to labor strife. Luckenbach Steamship Co. will more than double its service to take up the slack. American Hawaiian will continue to serve as agent for other lines and will provide other lines with terminal facilities and stevedoring through its subsidiary, Williams Dimond & Co.

**PG&E ON THE MOVE**—Pacific Gas and Electric Co. plans construction of another addition to its $44,000,000 steam-electric generating plant at Morro Bay, San Luis Obispo County. Plant will have two generators, each of 150,000-kilowatt capacity, and will be located on a 140-acre site. At peak capacity its boilers will consume 12,000 barrels of fuel oil daily. This is thirteenth major addition to PG&E power system since World War II.

PG&E is enlarging its "Super Inch" natural gas pipeline by 87 miles, which will increase delivery of out-of-state natural gas by 75%, or from 400,000,000 cu. ft. to 700,000,000 cu. ft. daily. Expansion is being accomplished by construction of four long paralleling sections known as "loops." Capacity of compressor stations will also be increased. Most out-of-state deliveries come from San Juan Basin on Colorado-New Mexico border and from Permian Basin in southwestern Texas.

Murphy's Powerhouse on Angeles Creek, Calaveras County, one of California's earliest hydroelectric powerhouses still in operation, is scheduled for retirement by PG&E. It will be replaced by a new plant incorporating a generator driven by a high-speed waterwheel employing more than one jet of water. New generating unit and its auxiliary equipment will sit on an open-air concrete foundation, and will be a completely automatic, unattended plant, under supervisory control from distant Stanislaus Powerhouse.

**TARS AND PIPES FOREVER**—Koppers Co., Inc., dedicates its new plant at Fontana. Plant, to be operated by Koppers Tar Products Division, will produce a general line of products made from the crude tar which comes from Kaiser Steel Corp.'s chemical-recovery coke ovens. This portion of the plant produces tar base pipe-line enamels widely used in the oil and gas industries.

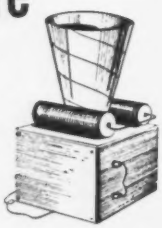


**STICKY STUFF FOR SANTA CRUZ**—Wrigley Chewing Gum Co. will go ahead with $3,000,000 modern factory at Mission St. and West Cliff Dr. in Santa Cruz previously announced, but delayed by material shortages. Plant, to supplement Wrigley's other U. S. plant located in Chicago, will employ about 300 persons.

**JUICY ITEM**—Exchange Lemon Products Co., Corona, plans improvements costing $872,000, due to increased demands for citrus juice products. Plans call for a cold storage warehouse of 50,000 sq. ft., and installation of equipment to increase amount of lemonade and other products.

**BIGGEST BULK LOADER FOR LA**—Los Angeles Board of Harbor Commissioners signs a five year lease on 28 acres of land in the West Basin area with Bulk Loaders, Inc. Newly formed company will build a $1,250,000 export bulk conveyor plant which will process 600 tons an hour, or a complete shipload every 12 hours. This will be largest and most modern bulk commodity loader for shipping on the West Coast.

# "Watson, come here –I want you!"



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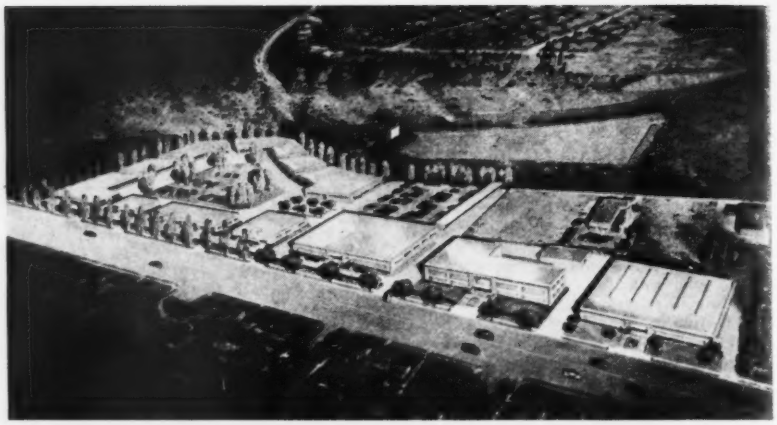

**"INSTRUMENT PARK"**—Pictured is an artist's conception of "Instrument Park," model precision instrument manufacturing center with a "campus atmosphere" whose development on a 20-acre Pasadena site is proposed by Consolidated Engineering Corp. If rezoning is accomplished, Consolidated will construct an engineering and research plant and a complete duplication of its present factory on the site. Remaining acreage will be offered to competitors as a plant site "for friendly competition in the design and fabrication of fine instruments."

**AIR FORCE MAY BUY CONVAIR PLANT**—The U. S. Air Force requests $5,000,000 for purchase of land and buildings of Consolidated Vultee Aircraft Corp.'s Plant 2, where it plans production of its F-102 jet interceptor. The plant, which contains 1,205,000 sq. ft., is currently leased to Convair for construction of other Air Force and Navy projects. It was sold in 1947 to C. W. Carlstrom and no recapture clause was included. Therefore, it will have to be repurchased on the open market.

**CONDA MILL READY**—A milling plant to process various strategic materials, such as titanium, asbestos, fire clays and aluminum, is completed on Conda Properties at Victorville at an estimated $200,000. This is part of a continuing $5,000,000 expansion program, for production of these vital materials by Conda Properties.

**L. A. HITS INDUSTRIAL RECORD**—Over-all investment in Los Angeles County last year for new factories and expansion of existing plants was $330,425,568, an all-time yearly high. Aircraft and parts production, with improvements of 156 facilities and investments of $100,198,180, put this industry in the lead. Other fields with high dollar investments and extensive improvements included foodstuffs and beverages, chemicals and paints, petroleum products and metal products.

**MICHIGAN FACTORY FOR REULAND**—Negotiations for purchase of a 12-acre factory site between Detroit and Lansing, Mich., by Reuland Electric Co., Alhambra, Calif., manufacturer of special electric motors and magnetic brakes, have just been completed. Upon completion of new facilities, company will transfer its headquarters to the Eastern plant.

**GROWING SUMS**—Latest of diversified industry to locate in San Fernando Valley is Johnston Adding Machine Co. plant, located at 10939 Van Owen St., North Hollywood. Firm will produce a modern, power-driven adding machine, featuring a ten-key board, which eliminates the necessity of selecting the proper column before entering first digit of a given number.

**FMC BUYS A BOXER**—Food Machinery and Chemical Corp., San Jose, acquires Kingsbury-Davis Machine Co., Contoocook, N. H., manufacturer of specialty machinery used in paper box production. Newly acquired firm will be operated under present management as a FMC subsidiary and an affiliate of Food Machinery's Stokes and Smith Co., Philadelphia, Pa.

**MORE NORTHROP REAL ESTATE**—Northrop Aircraft, Inc., Hawthorne, enters into an agreement to purchase approximately 65 acres of land lying east of Crenshaw Blvd., adjacent to its present plant. Land is being acquired to provide maximum efficiency for company's flight operations from Hawthorne Municipal Airport and for possible future expansion.

**CROWN IN CANADA**—Crown Zellerbach Corp., San Francisco, is considering an agreement whereby stockholders of Canadian Western Lumber Co., Ltd., can exchange one share of Crown common stock for each six shares of outstanding stock of Canadian Western. Crown would probably acquire about 75% of firm's outstanding stock under this arrangement. Canadian Western Lumber is a large producer of lumber, plywood and forest products, and owns extensive timberlands in British Columbia. It also owns 50% of the oustanding stock of Elk Falls Co., Ltd., Vancouver Island newsprint producer. Other 50% is owned by Zellerbach's Canadian subsidiary, Pacific Mills, Ltd.

**CERTIFICATES OF NECESSITY**—Defense Production Administration issues certificates of necessity for the following defense-connected industrial projects: Sequoia Metalcraft Co., San Carlos, $110,000 for magnesium sand castings at a fast write-off of 65%; Western Pacific Railroad, San Francisco, $3,650,000 for railway transportation at 70%; U. S. Electrical Motors, Inc., Anaheim, $3,871,129 for aircraft transmissions at

55%; Lockheed Aircraft Corp., Burbank, $172,812 for aircraft parts at 60%; Douglas Aircraft Co., El Segundo, $316,146 for aircraft parts at 65%; Honeycomb Structures, Inc., Los Angeles, $99,000 for aircraft parts at 50%; Pioneer Broach Co., Los Angeles, $69,713 for machine tools at 55%; Union Lumber Co., Fort Bragg, $592,608 for sawmill waste at 40%; Bethlehem Pacific Coast Steel Corp., South San Francisco, $278,000 for steel production; Southern Pacific Railroad, Ferrum (Riverside County), $93,900 for railway transportation at 40%; Hughes Tool Co., Culver City, $92,731 for fire control systems at 40%; Flying Tiger Line, Burbank, $9,100,000 for air transportation at 80%; Mechanical Specialties Co., Los Angeles, $91,682 for tools, dies, jigs and fixtures at 70%; Weston Hydraulics, Ltd., North Hollywood, $61,820 for aircraft parts at 70%; Robertshaw-Fulton Controls Co., Anaheim, $94,651 for aircraft parts at 65%; Raffety & Co., Inc., Brawley, $69,595 for cotton gin at 55%; Harvey Machine Co., Torrance, $18,800,000 for aluminum sheet and plate at 50%; Mars Engineering & Manufacturing Co., Burbank, $175,716 for aircraft parts; $101,263 for aircraft parts; Pacific Gas & Electric Co., $4,660,800 for San Bernardino-Kings County gas line; Pacific Gas & Electric Co., Morro Bay, $44,310,600 for power; Wilshire Oil Co., Norwalk, $148,000 for sulphur from waste gas; Burg Tool Manufacturing Co., Burbank, $145,000 for machine tools.

**MORE DIESELS FOR SP**—Southern Pacific Railroad purchases another 100 diesel locomotives, comprising 150 units with a total of approximately 225,000 hp. This brings firm's diesel fleet to more than 1,400 units.

**MORE GLASS** — International Glass Corp., Los Angeles, purchases all plant facilities and equipment of Perrault Glass Fiber Corp., Newport, Ark., manufacturer of glass fiber and glass fiberpipe wrap, outer wrapping for pipe, roofing material, battery retainers, battery separators, and irrigation canal liner.

**KRESKY-WARD FURNACE MERGER**—Kresky Manufacturing Co., Petaluma manufacturer of oil floor furnaces, acquires Ward Heater Co., Los Angeles producer of gas floor furnaces, formerly operated by the Estate Heatrola Division of the Noma Electric Corp., New York.

**RYAN BOOSTS BACKLOG** — Ryan Aeronautical Co., San Diego, receives orders totaling around $15,000,000 from Boeing Airplane Co. for production of major components for the C-97 Stratofreighter military transport plane. This boosts the company's backlog to $80,000,000.

**POWDER METALLURGY** — The first equipment in Los Angeles for the manufacture of parts by the powder metallurgy process has been installed in the plant of E. A. Vermere, Inc., manufacturer of parts for plumbing fixtures. Heretofore they have been using the die casting process.

**OAKLAND PLANT EXPANDS**—General Metals Corp., subsidiary of Transamerica Corp., awards general building contract to Carl N. Swenson Co. for construction of a $5,000,000 expansion of its Oakland foundry.

**SMOG CONTROL BLUEPRINT** — San Diego's Board of County Supervisors has appointed a smog-control committee instructed to find out extent of smog menace in that area and formulate a method for its control. County expects to avoid much of the smog hazard by acting in advance of the problem. (They should read article in February "Western Industry" about voluntary efforts in San Francisco Bay area.)

**PIPE FOR LEASE**—American Extruded Products Co., Hollywood producer of plastic garden hose and newly developed rigid plastic pipe, plans to lease its rigid plastic pipe to pipe line, irrigation and utility companies. Pipe, which will come with a complete line of plastic fittings and which will be available in sizes from a half inch to six inches, will be leased for ten-year periods, with substantial reductions in monthly rental at specific periods. Object is to save renting firms the cost of major capital investments while enabling them to replace less resistant metallic lines with plastic pipe.

**UTLILITIES REQUEST MORE LINE**—Southern California Gas Co. and Southern Counties Gas Co. of California request a certificate of public convenience

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and necessity from state public utilities commission to build a 73-mile pipeline, increasing firms' Texas pipeline system by 151,700,000 cu. ft. of gas daily. Three 1,760-hp. compressor units would also be installed at the Blythe compressor station. Total cost would be approximately $7,482,194.

**EUREKA FOR NEVADA**—Central Eureka Corp. proposes to acquire a sulphur production enterprise in northwest Nevada which has been financed and developed by Edward H. Heller, Central Eureka's principal stockholder. This unit, which would produce a net profit of $500,000 a year, is being made available to that company on an actual cost basis.

**COCONUT OIL PLANT IN BUTTE COUNTY**—Henry Irving, San Francisco, purchases the Coronet Olive Oil Mill in Thermalito for $34,000 at public auction. Plant will be used to process coconut oil imported from Hawaii. About $80,000 will be sent in plant conversion.

**AEROJET-CROSLEY MERGER**—Aerojet General Corp. is formed by merger of Crosley Motors, Inc., Cincinnati, and Aerojet Engineering Corp., Azusa, both owned by General Tire and Rubber Co. Cincinnati division will manufacture metal parts for jet-assisted take-off rockets. Propellants for rockets will be loaded at Aerojet plants in Azusa and Sacramento.

**SHEET STEEL MILL CLOSED**—Columbia Steel Co.'s 42-year old sheet steel producing mill at Torrance is being closed in order to divert more raw material to the manufacture of ammunition. Government directive requires stepped-up production in other departments of the plant to produce a large amount of special steel for ammunition.

**THE SOLAR SITUATION**—New 7,500-sq. ft. dustproof factory building is being constructed by Solar Aircraft Co. on its San Diego leasehold. Structure will be used for assembly of small gas turbine engines, and will be adjacent to the present turbine test building. A system to provide forced, filtered air will be installed along with a special floor dust control covering.

Solar has received contracts in excess of $500,000 from Consolidated Vultee Aircraft Corp. for components for both civilian and military Convair-built aircraft. Contract calls for construction of exhaust systems for T-29 navigation trainers as well as augmentors for use on the T-29 Convair-Liner.

**LINDBERG FLIES WEST** — Lindberg Engineering Co., Chicago, opens its new West Coast plant at 11937 S. Regentview Ave., Downey. Factory comprises 12,000 sq. ft. of production and office space and will be used to manufacture industrial heat treating furnaces and other Lindberg products used in aircraft and other vital West Coast industries.

**WATER HEATER FIRM** — American Appliance Manufacturing Corporation is formed by A. H. Sutton and E. S. Todd, to engage in the manufacture of water heaters under the trade name, "America." Offices will be located at 10861 Venice Blvd., Los Angeles. They were until recently president and sales manager, respectively, of Mission Appliance Corp.

**WALNUT EXPANSION** — California Walnut Growers Association plans an expansion program which includes purchase of a 33-acre site on Washington Blvd. in East Los Angeles, building of a shelling plant and administration building for an investment of about $3,500,000.

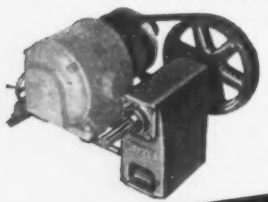
**RICE GROWERS PROJECT** — The Farmers Rice Growers Cooperative plans to build a $1,000,000 installation in the Sacramento-Yolo Port District area. A rice drier and storage elevator will be built first. A mill and warehouse will be added later. Project will be located on a nine-acre site and will eventually employ about 150 persons.

**NEW HOME FOR MALLORAN**—The Malloran Corp., Los Angeles, leases the former Orange Belt Packing House at 805 E. Center St., Anaheim, for the manufacture of fiberglas plastic products. New plant contains 43,000 sq. ft. of floor space.

## COLORADO

**COLORADO GAS FOR NORTHWEST**—Pacific Northwest Pipeline Co., Houston, Tex., offers to purchase 15,000,000 to 35,000,000 cu. ft. of natural gas a day from Colorado's Rangely oil field for transmission in proposed pipe line to Pacific Northwest.


...increase production, lower operating costs!



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**TUNGSTEN ORE PLANT** — Minerals Engineering Co., Grand Junction, plans construction of a $225,000 tungsten ore concentration plant near Glen, Beaverhead County, and a refining mill at Salt Lake City.

**MINE SALES**—Alexander Film Co. sells its perlite mill at Florence and its alexite mine at Rosita to Great Lakes Carbon Corp., so that it can concentrate on motion picture and television business.

**LOGAN PIPE LINE** — A $2,000,000 pipeline tapping Logan County oil fields is now in operation. Oil, which travels over pipeline at the rate of 70,000 barrels a day, was formerly trucked from the Denver-Julesburg Basin to Gurley, Neb., for shipment to the East. New connection is designed to open up new markets of northeastern Colorado crude oil.

## IDAHO

**ANTIMONY AGAIN**—Sunshine Mining Co., Wallace, reopens its antimony plant which was built during World War II and closed in 1944 because of change in type of ore mined at Sunshine properties. Recent boost in smelting rates on tetrahedrite concentrate (ore containing antimony, silver and copper) are high enough to warrant reopening plant. Certain changes will be made in mill so that both lead and tetrahedrite concentrates can be turned out.

## MONTANA

**OPEN PIT MINE** — U. S. Steel Corp. expects to carry on large open pit operations on its high grade fluorite deposits on Crystal Mountain, Ravalli County, south of Darby, after its winter shutdown. Since September of last year 250 tons per day of 96% calcium fluorite have been shipped to U. S. Steel's Geneva plant. A slightly improved grade of the product would make it applicable for production of hydrofluoric acid.

## NEVADA

**GABBS VALLEY PLANT ADDS**—Basic Refractories, Inc.'s Gabbs Valley plant will be provided with about $400,000 worth of improvements. Plant, which cost $2,250,000 in 1951, produces about 100,000 tons of granular magnesia refractories annually, as well as large quantities of brucite and magnesite.

**RARE METALS EXPERIMENT STATION**—Contract is awarded to Nomellini Construction Co. to build a rare and precious metals experiment station on University of Nevada campus. Building is to be erected on a tract deeded to the federal government. It is a U. S. Bureau of Mines approved project.

## NEW MEXICO

**NEW GAS FIELD**—Albuquerque Associated Oil Co. is making tests on a natural gas field in Sandoval County. At 963 ft. a drillstem test indicates a flow of gas between 500,000 and 1,000,000 cu. ft. a day.

**HELIUM**—The Navajo helium plant at Shiprock is now in limited operation. Purpose of unit is to separate helium from natural gas. The helium is then piped to Gallup for railroad tank car loading.

## OREGON

**ST. HELENS CROWN**—Crown Zellerbach Corp., San Francisco, completes preliminary arrangements for acquisition of St. Helens Pulp & Paper Co., St. Helens. Mill is now being expanded to a 90,000-ton-per-year capacity. Crown's offer is contingent upon acquisition of 80% of the stock.

**SAWMILL SALE**—Independence Lumber & Manufacturing Co., a band mill operation in Independence, is purchased by a group of Oregon lumber men, including Joe Crahane, one of the owners of Fir Valley Lumber Co., Monroe.

**TIMBER-TECH** — Timber-Tech Corp., Portland, is organized to manufacture glue-laminated timbers, trusses and other products. Firm will spend about $350,000 on a plant near Eugene for this purpose.

**MORE ABOUT SAWMILLS** — Clay Brown & Co., Portland corporation op-

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erating two sawmills at Fortuna, Calif., sells all its capital stock to a group headed by C. N. Souther, of Portland. New owners have leased the properties of Fortuna Sawmills, Inc., a California corporation.

**MORE SALT EXPECTED** — Pennsylvania Salt Manufacturing Co. purchases 22 acres of land in Portland from Northern Pacific and SP&S railroads. Property, which cost about $65,000, includes 790 ft. of waterfront on Willamette River. Tract was acquired for future expansion.

**GE IN OREGON**—Ground is broken on General Electric Co.'s new Portland service shop and warehouse, which, when completed will represent an investment of about $500,000. New facilities are to be located on a five-acre plot and will encompass more than 44,000 sq. ft.

**LUMBER BUSINESS GIVEN TO CHURCH**—Clyde H. Harris, Pendleton, owner of Harris Pine Mills, Inc., a $10,000,000 lumber business, turned over his entire operation to the Seventh-day Adventist Church. The lumber business employs 700 persons at assembly plants in Chicago, Alexandria, Va., and Cleburne, Tex., and in milling and logging operations near Pendleton. Firm ships 2,000 pieces of unfinished furniture a day, and manufactures and sells 50,000,000 board ft. of lumber annually.


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The Nolan Car Door Opener gives one man a tremendous amount of pulling energy, to get the most stubborn, hard-rolling door wide open in a hurry!

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## WASHINGTON

**ABOUT A BOAT**—Commercial Ship Repair, Winslow Division, Winslow, receives a $700,000 contract to build the hull of a $1,050,000 ferry for the San Diego & Coronado Ferry Co. Hull will be built at Commercial's Winslow yard.

**PLYWOOD PLANT REOPENS**—Resinweld Plywood, Inc., Tacoma worker-owned plywood plant, is preparing to reopen following a 60 day continuance of a case involving nearly $500,000 in claims against the company. Plant will turn out only sheathing grades—about 2,000,000 sq. ft. monthly on a ⅜-in. basis.

**MINING LEASE**—Sunlight Mining Co., Spokane, is granted a 20-year lease on 617 acres of government-owned phosphate land in Boulder mining district near Maxville, Mont. Firm's bid amounted to $6,235. Phosphate production is scheduled to start shortly.

**OLYMPIA GETS GEORGIA PEACH**—Georgia-Pacific Plywood Co., one of the three biggest in the country, plans to move its headquarters from Atlanta, Ga., to Olympia. Firm has a new two-story general office building in Olympia which now serves as Western Division headquarters.

**CHEMICAL FIRM FORMED** — Four Spokane men form Custom Laboratories, at N. 715 Lincoln, Spokane, and will commence making and distributing their own line of industrial chemicals. Company will handle a complete line of waxes, soaps, cleaners and industrial chemicals, and will also produce and market industrial chemicals.

**APPAREL APLENTY**—Apparel, Inc., Seattle sportswear firm, plans to establish a $250,000 factory in Olympia, which will employ about 350 or 400 persons. New plant will not affect operations of the Seattle unit which employs about 250.

**SPOKANE FIRM MAKES ALUMINUM TUBE** — Aluminum Supply Co., Spokane, has perfected a method of seam welding aluminum irrigation tubing and is turning out 27,000 ft. a day of three-in. tubing. Firm will soon move to a new factory at N. 824 Fancher, Spokane. Move will up production capacity to 100,000 lineal ft. a day, in four-, five-, and six-in. sizes.

**MORE BELLS FOR WASHINGTON**—Pacific Telephone and Telegraph Co. anticipates an expenditure of $28,000,000 for new equipment and installations in Washington in 1953. One of the firm's major projects will be construction of a new microwave-radio relay system between Spokane and Yakima which will increase long-distance facilities. There will also be a new cable between Pasco and Yakima, and a new $1,700,000 switchboard is being installed in the Spokane office. A second major project will be construction of extended telephone service facilities in the Greater Seattle area.

**COAL PROCESSING PLANT**—A $300,000 coal processing plant is planned near Renton, Wash., by Hi Carbon & Chemical Co. Installation will produce coal by-products such as industrial carbon and coal tars. Plant will employ about fifty people.

## WYOMING

**SULPHUR PLANT**—Seaboard Oil Co. is completing construction of a $1,500,000 sulphur manufacturing plant approximately 21 miles northwest of Powell. It is designed to turn out a maximum of 50 tons daily. It will handle about 4,000,000 cu. ft. of sulphur gas from company's Silver Tip field.

**MORE ABOUT SULPHUR**—Representatives of eight major oil companies met with 200 residents of Manderson to discuss building a new sulphur plant in that area. No site for plant has been selected, but extensive tests are being carried out to determine extent of producing area, probable amount of gas available and size of plant needed.

**SODA ASH PLANT**—Now in operation is Food Machinery and Chemical Corp.'s Westvaco plant at Green River. This soda ash plant has a capacity of 300,000 tons a year, and deposit is estimated as being large enough to provide the entire needs of the nation for the next 35 years.

**NEW STANDARD UNIT**—M. W. Kellogg Co., New York, is awarded a contract for construction of a new alkylation unit at Standard Oil Co.'s Casper refinery. Unit is designed for producing 700 barrels per day.


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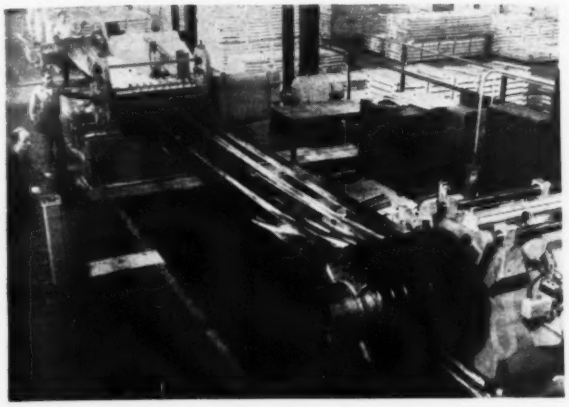

## SLITTING MACHINE
### strips various coil sizes

THIS NEW slitting machine was recently placed in operation at the Los Angeles steel service plant of Joseph T. Ryerson, Inc. It will slit strip of almost any width from sheet steel, in coils to 48 in. wide and 3/16 in. thick, making it possible to supply various coil sizes as well as straight lengths in types and tempers of sheet steel to customer's specifications. An increasing tonnage of sheet steel in slit coil form is being demanded to satisfy production needs of contract shops and manufacturers engaged in stamping, blanking, and forming work.

## FORECAST ON
### natural gas

IMPACT of natural gas on the economy of the Pacific Northwest will be gradual, rather than sudden, according to N. H. Engle, director of the Bureau of Business Research, University of Washington. Speaking before the Washington and Oregon chambers of commerce at Portland in February, he explained that:

1. Natural gas will first find its way into industrial uses where it is competitive with oil and coal. It will have to be cheap enough to justify conversion costs. Such heavy users of fuel as cement plants will probably be among the first customers. Certain of the chemical industries may also be expected to use it. An alumina plant would be a natural user of gas, and once gas is available it will provide an additional energy base to attract new industries.

2. Existing gas distribution plants will have a great deal of work to do before markets can be expanded greatly, particularly the residential. Few gas mains have been laid in recent years and many of the new residential districts are not supplied with gas.

3. As the region expands, the market for oil products will also grow. This is sound logic which may be applied to coal, although to a lesser extent.

4. Natural gas will reduce the electric energy shortage, and the domestic market may become a battleground between gas and electric utility companies and between gas and electric appliance manufacturers.

5. While the figure most frequently quoted for probable consumption of natural gas in the first 30 years of life of the proposed gas line is 2½ trillion cubic feet, his estimate is at least 3½ trillion.


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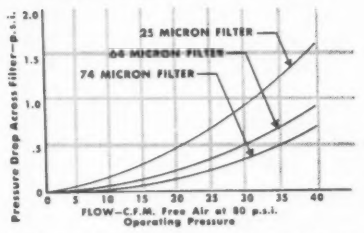


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# WESTERNERS AT WORK

## Arizona

JOHN T. KIMBALL and A. H. FORMAN, JR., both former vice presidents, are named executive vice presidents of *Arizona Public Service Co.*

P. C. GAFFNEY is appointed vice president of *Southwest Lumber Mills.*

## California

RAYMOND F. STANLEY, formerly a consulting engineer affiliated with *Production Management Engineering Associates,* joins *National Motor Bearing Co., Inc.,* Redwood City, as chief industrial engineer.

*R. F. Stanley*

*P. M. Magoon*

PAUL M. MAGOON is appointed industrial relations manager of *Dalmo Victor Co.,* San Carlos.

CECIL BARDWELL comes out of retirement to rejoin *Bardwell & McAlister, Inc.,* of Los Angeles, as director and vice president.

HUGH F. COLVIN, engineer-executive, is promoted to position of vice president and treasurer of *Consolidated Engineering Corp.,* Pasadena.

LUDLOW SHONNARD, JR., is elected vice president of *Southern Counties Gas Co.,* Los Angeles.

G. W. HART, superintendent of measurement, is appointed assistant manager of gas department, *General Petroleum Corp.,* Los Angeles, and A. L. SAULSBURY is named senior drilling foreman for production department's southern division.

*North American Aviation, Inc.,* appoints JOHN J. FLUCK general manager of their Fresno plant. L. S. WAIT, previous plant manager, is appointed assistant to vice president at Los Angeles.

J. M. COLEMAN is named manager of operations for *Sperry Division* of *General Mills, Inc.,* at San Francisco.

*Pacific Airmotive Corp.* promotes WILLIAM MAXFIELD, formerly director of maintenance and engineering for *Braniff Airways, Inc.,* to post of assistant vice president. New Burbank aircraft division manager is GALEN POTTER, former assistant manager for *AiResearch Aviation Service Co.* ROBERT D. BRAHM is advanced to assistant division manager at PAC's Chino plant.

DR. SIMON SONKIN is appointed as professor in *Stanford University's* microwave laboratory, Palo Alto.

J. O. PERMENTER, mill foreman of *Caspar Lumber Co.,* Mendocino County, is retiring and will be replaced by TED JOHNSON.

DR. MARK MILLS, former group leader in *North American Aviation's* atomic energy research department, Los Angeles, is appointed to *Scientific Advisory Board* to *Chief of Staff, U. S. Air Force.*

W. N. BARTLESON of *Harbison-Walker's* Baltimore works is transferred to their new plant at Warm Springs, as superintendent.

CURTIS L. BATES, of *Northrop Aircraft, Inc.,* joins *Ryan Aeronautical Co.,* San Diego, as assistant director of engineering.

GERALD E. MCEVOY is named director, vice president and treasurer of *Pacific Tube Co.,* Los Angeles.

J. JUDSON TAYLOR is elected vice president and treasurer of *Western Air Lines,* at Los Angeles.

CLARENCE E. MILLER, *A. Schilling & Co.,* division of *McCormick & Co., Inc.,* San Francisco, retires as president. JOHN D. MILLER, Schilling executive vice president, will become general manager. ROBERT C. CRAMPTON, vice president, is to be general sales manager.

PETER J. TOTINO is appointed to position of chief process planner, manufacturing division of Pasadena's *Consolidated Engineering Corp.*

DR. HAL G. JOHNSON, former assistant director of general development department, is named director of research and development for western division of *Monsanto Chemical Co.* JOHN T. STEPHEN is named assistant director of research.

W. G. HEWITT is appointed president and general manager of *Pacific Guano Co.,* Berkeley, succeeding WELLER NOBLE, who is retiring.

FREDERICK B. LOWE is appointed service department manager of *Dashew Business Machines, Inc.,* Los Angeles.

JOHN O. ALMEN joins *Western Gear Works* as an engineering and research consultant at Lynwood. ROY CRAWSHAW is named president of newly formed *Mission-*

*J. O. Almen*

*R. Crawshaw*

*Western Engineers, Inc.,* of Pasadena, while J. C. MCREYNOLDS is executive vice president; J. DAVID, vice president in charge of engineering; T. J. BANNAN, treasurer, and MRS. F. M. ANDREW, secretary.

FRANK MURPHY is made Western regional vice president and general manager, and FREDERICK D. GOODYEAR is named Western regional vice president in charge of sales, for *Best Foods, Inc.,* San Francisco.

E. H. DAVIS, formerly secretary-treasurer of *McNeil Construction Co.,* is appointed treasurer of *Kwikset Locks, Inc.* A. J. UNE-


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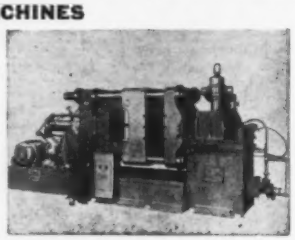

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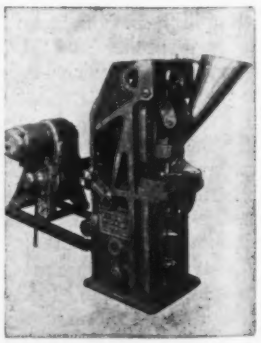

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TIC, formerly laboratory director at *Jack & Heinz, Inc.*, becomes chief engineer, replacing GEORGE LOGAN, resigned.

RUSSELL KETCHUM becomes service manager of *Friden Calculating Machine Co.*, San Leandro, succeeding WALTER BOURNE, retired.

WILLIAM A. PLOURDE is appointed manager of master planning for guided missile division of *Consolidated Vultee Aircraft Corp.*, Pomona. M. K. HIGDON takes over duties of assistant manager of master planning.

HOWARD M. RIX chosen as vice president and general manager of *Cooper Precision Products* of Los Angeles.

BERNARD WILSON, formerly a senior engineer of *Computer Research Corp.*, is appointed chief test engineer of manufacturing test department.

AVERY W. ACKLEY, former director of *Loven Chemical Co.* of California, is named research director of *Calresin Corp.*, Arcadia.

H. L. RHODES is named manager of chemicals-pigments-metals division plant of *Glidden Co.*, at Oakland, and E. L. RALSTON is appointed manager of mining properties in California and Nevada.

ERNEST L. BLACK is named manager and J. P. SELEERG, chief engineer of *Borg-Warner Corp.'s* petroleum mechanics division which will have its headquarters in North Hollywood.

*Solar Aircraft Co.* at San Diego promotes HENRY ALBRECHT to superintendent of experimental division; KENT CAMPBELL, assistant manager of contracts division; BILL CORDS, chief contract administrator of aircraft and engines, and TOM CONLON, chief tool designer, tool design department. ROBERT S. PUTNAM is named industrial relations division manager of Solar Aircraft Co.'s San Diego plant.

EDWARD H. HUGHES is named director of industrial relations for *G. M. Giannini & Co., Inc.*, Pasadena.

T. F. BOYLE, assistant to district engineer at Alameda works of *Bethlehem Pacific's* fabricated steel construction division, is appointed works engineer.

*T. F. Boyle*

*P. D. Cornelius*

PAUL D. CORNELIUS is appointed to head design and research department of *Vlier Engineering, Inc.*, Los Angeles.

I. NEWTON KIMSEY is appointed Western division manager for *B. F. Goodrich Co.*, with responsibility for Los Angeles, San Francisco, Seattle, Denver, etc.

*General Petroleum Corp.* reports following executive changes: JOHN C. SAMPLE is elected vice president and will coordinate company's manufacturing, pipe line and


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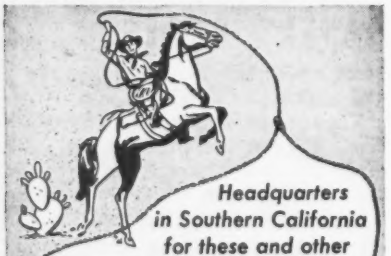

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supply activities. R. O. SWAYZE is elected vice president and director of production, succeeding M. S. APP, who is retiring; J. T. DURKEE, retaining post of comptroller, is elected vice president and director of production. He replaces WESLEY CUNNINGHAM, also retiring. A. D. BENNISON, manager of oil exchange and supply department is elected director of oil supply. A. O. WOLL, director of company's marine department, is retiring with no successor yet named.

CLAY T. COLLEY, formerly a materials handling consultant and manufacturers representative in Los Angeles, later recalled to Navy Duty as a lieutenant-commander, is appointed by Navy as officer in charge of Materials Handling Laboratory, Earle, N. J.

EMMETT J. NORRIS, JR., chief accountant of *Calaveras Cement Co.*, San Francisco, is appointed assistant treasurer.

O'BRIEN HENDERSON, vice president and sales manager of *Ry-Lock Co.*, San Leandro, is newly elected president of San Leandro Chamber of Commerce.

Five key engineering positions created by consolidation of *Northrop Aircraft, Inc.'s* aircraft and guided missile engineering activities are filled as follows: DR. WILLIAM F. BALLHAUS appointed assistant chief engineer in charge of analytical activities; CLARE HARRIS named assistant chief engineer in charge of projects and components; FRANK B. BOLTE becomes chief of engineering research; STANLEY J. WORTH appointed chief engineering administrator; W. R. CLAY, chief project engineer. Simultaneously with engineering appointments, R. A. Hall is named chief of newly-established electro-mechanical laboratories.

A. L. LYMAN is elected to position of executive vice president of *California Research Corp., Standard Oil Co. of California* subsidiary, and A. H. BATCHELDER is elected a vice president and director. Batchelder will also be general manager of Cal Research laboratories at Richmond.

DR. CLEDO BRUNETTI will resign as associate director of *Stanford Research Institute* effective March 1. He will join *General Mills* mechanical division, Minneapolis.

*Continental Can Co., Inc.*, names PAUL E. KREISCHER, Tonawanda, N. Y. plant manager, to position of plant manager at Pittsburg, Calif.

JACK HAUSER, formerly *Minnesota Mining & Manufacturing Co.* sales engineer, is appointed application engineer for *Ampex Electric Corp.*, Redwood City.

LAWRENCE GILES is named to act as president during a leave of absence granted to DAKEN K. BROADHEAD, president of *Allied Record Manufacturing Co.*, Los Angeles.

H. L. FARRAR resigns as president of *Coast Counties Gas and Electric Co.*, San Francisco. J. K. HORTON, president of *Pacific Public Service Co.*, is now also president of Coast Counties. DEXTER STONER is now controller of Coast Counties.

KENNETH C. WHITE, general sales manager, and ALEX TURNER, general factories manager, are named vice presidents of Pacific Coast division of *Owens-Illinois Glass Co.*, San Francisco.

JOHN W. HANCOCK is elected president of *Hancock Oil Co.*, succeeding WILL J. REID, who is elevated to chairman of the board.

## Colorado

PIERCE C. WALKER is appointed manager of operations for *Colorado Standard Lead-Zinc Mines, Inc.*, at Lake City. He was promoted from mill superintendent.

JONATHAN D. LANKFORD, chief of processing section at oil-shale demonstration plant near Rifle, is now chief of fuels technology division for *Bureau of Mines* Region Five.

J. K. PETERS, mechanical engineer for *Denver & Rio Grande Western* railroad, is named assistant chief mechanical officer. ROBERT L. JACOBSEN will succeed him. PAUL D. STARR, master mechanic at Grand Junction, is promoted to superintendent of diesel equipment. FRANK A. ROBINSON is named to post of assistant electrical engineer, and J. P. SPIESS is now diesel instructor.

## Idaho

I. A. WOLTERS, formerly with *Northern Pacific Railroad*, is named as manager of *Camas Prairie Railroad*, Lewiston. He succeeds I. M. LAGERQUIST, resigned.

## Montana

THOMAS K. GRAHAM is new assistant general superintendent of Great Falls reduction department of *Anaconda Copper Mining Co.* GUY T. WEVER succeeds him as superintendent of electrolytic zinc plant.

JOHN HORN of Libby, safety director of *Montana Industrial Accident Board* and president of *Montana Safety Council*, has resigned as safety director.

## Nevada

ARTHUR W. BARTOLIC becomes chief of engineering, public works department, *Naval Ammunition Depot* at Hawthorne. Formerly with *Army Engineers, General Services Administration* and *U. S. Public Health Service.*

MAX J. KENNARD is promoted from chief engineer of *Combined Metals Reduction Co.* at Salt Lake City, to manager of *Pioche Manganese Co.*, at Las Vegas. R. W. LOTTRIDGE is promoted to manager of Henderson plant, F. R. LEONARD is named metallurgical assistant to the general manager, and F. B. PETERMAN is appointed assistant plant manager at Henderson.

G. ROBERT HENRY is appointed executive vice president for *Bonanza Airlines*. JAMES RUSTAD, formerly chief engineer, is named purchasing agent.

## Oregon

C. S. LEONARDSON is named general manager of glue manufacturing division of *U. S. Plywood Corp.*, Portland.

PAUL F. WRAY, office manager and purchasing agent at *Umpqua Plywood Corp.*, Roseburg, resigns that position to take over as general manager of *Medford Veneer & Plywood Corp.*, at Medford.

W. J. LINFOOT, formerly with *United Growers*, is named manager of *Producers Co-op Packing Co.*, Salem, succeeding W. H. WOOD.

L. C. FUCHEK, vice president and manager, Puget mill division, is named general manager of lumber division, *Pope & Talbot, Inc.*, Portland. ALDEN J. FISCHER, sales manager, will become a vice president and succeed Fuchek.

J. V. MCALISTER, *West Oregon Lumber Co.*, is elected president of *Columbia Basin Sawmills*, Portland. Other officers include

O. H. STREET, *Inman-Poulsen Lumber Co.*, vice president; R. H. LOGAN, JR., *Oceanside Lumber Co., Inc.*, secretary-treasurer; E. H. CROSBY, *Columbia Basin Sawmills*, assistant secretary-treasurer.

GERALD R. STEWARD is named general superintendent of *Dwyer Lumber Co.*, Portland.

### Utah

PERRIE E. BRUSE of Aurora is named manager of the Salt Lake City district of *Pacific Intermountain Express Company's* operations.

JOHN G. HALL becomes assistant plant manager of *National Lead Company's MacIntyre Development Corp.*, titanium division.

J. P. CAULFIELD is appointed general manager of Western mining division of *Kennecott Copper Corp.* STANLEY HUGHES is now in charge of smelting and refining operations in Utah.

J. M. EHRHORN, formerly assistant manager of western mines, is appointed industrial development director, and will head a new industrial development department of *U. S. Smelting, Refining and Mining Co.* BORIS ASHURKOFF joins the department as industrial engineer.

ARTHUR C. RITTER is appointed assistant general manager of properties for *Union Pacific Railroad.* He was formerly manager of industrial development at Los Angeles, and will shift his headquarters to Salt Lake City.

### Washington

CHARLES E. DEVLIN, formerly sales manager for *Simpson Logging Company*, is named executive vice president and general manager of *Northwest Door & Plywood Sales, Inc.*, with headquarters in Tacoma.

DR. GRANT I. BUTTERBAUGH, professor of business administration at *University of Washington*, becomes editor-in-chief of a new international publication on statistical quality control.

DONALD E. DOUGLAS is elected vice president of *Pacific Car & Foundry Co.*, Seattle.

FRANK A. DRUMB, resident manager of *Crown Zellerbach Corp.* specialty paper mill at Camas, is promoted to assistant vice president, in charge of special projects, with offices in San Francisco. GEORGE H. GALLAWAY, assistant manager at Camas, is promoted to resident manager.

LYSLE A. WOOD, chief engineer, is named by *Boeing Airplane Co.* to newly created position of director of pilotless aircraft. GEORGE C. MARTIN, chief project engineer for aircraft, will be responsible for overall direction of preliminary design and flight tests.

ROGER O. OSCARSON, Spokane mining engineer and former secretary of *Northwest Mining Association*, is appointed minerals economist with *Bureau of Land Management's* division of minerals.

MARK P. HENGEN, traffic manager of *Ralston Purina Company's* Denver plant, will become new manager of the Spokane plant.

W. E. JOHNSON, general manager of *General Electric Company's* nucleonics division, is awarded the "Fellow grade" membership in *Society of Mechanical Engineers.*

## ASSOCIATIONS ELECT

*California Personnel Management Association:* President, WILLIAM L. INGRAHAM, general manager of personnel department of *Standard Oil Co. of Calif.;* vice president, DAVID C. PATRICK, personnel manager of *W. P. Fuller & Co.*

*Aircraft Industries Association:* National chairman of industrial relations committee, JOHN B. CLARK, industrial relations director for *Northrop Aircraft, Inc.*

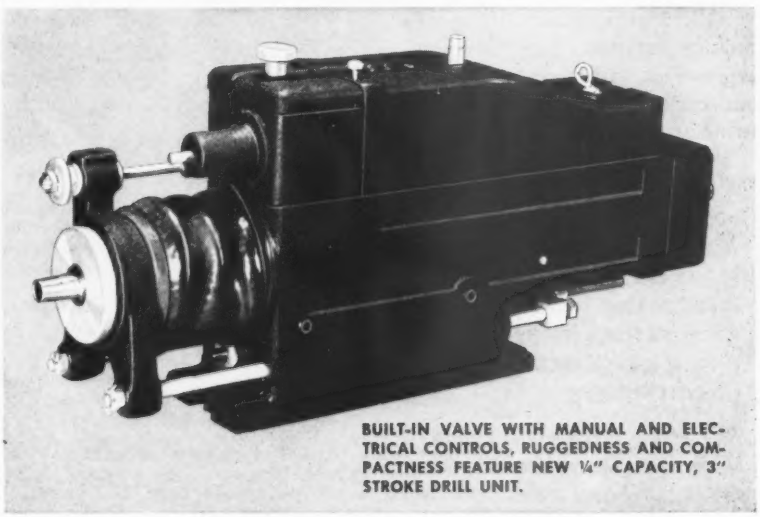
*Paper Mills Men's Club*, Los Angeles: President, C. J. WARREN, *Solo Cup Co.;* vice president, J. C. FISCHER, *Sherman Paper Products Corp.;* secretary, B. E. CALHOON, *Marathon Corp.;* treasurer, J. L. PERRIN, *Towlsaver, Inc.*

*California-Nevada Manufacturers of Carbonated Beverages:* President, WILLIAM B. TRUEMAN; vice president, ROY W. GETCHEL; treasurer, GEORGE MARTINSON; secretary, GEORGE CULLEY.

*American Society of Tool Engineers*, Denver chapter: Chairman, CLINTON J. HELTON; first vice chairman, WILLIAM KRIEGER; second vice chairman, NORVAL ALLEN; secretary, GEORGE BUCKEL; treasurer, ALEX WILCOX.

*Montana Mining Association:* President, TED E. COLLINS, trustee for *Marysville Gold Mining Co.;* first vice president, FRED E. BURNET, superintendent of *Montana Phosphate Products Co.;* second vice president, CHARLES S. BURRISS, plant manager of *Ideal Cement Co.;* secretary-treasurer, CARL J. TRAUERMAN, president, *Butte Copper Consolidated Mines.*

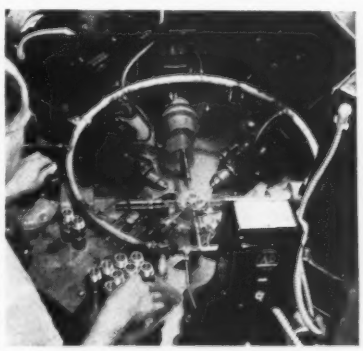

## BELLOWS-LOCKE DRILL UNIT COMBINES HYDRAULIC FEED, AIR-POWERED TRAVERSE, ELECTRICALLY DRIVEN SPINDLE



BUILT-IN VALVE WITH MANUAL AND ELECTRICAL CONTROLS, RUGGEDNESS AND COMPACTNESS FEATURE NEW ¼" CAPACITY, 3" STROKE DRILL UNIT.

PRECISION adjustable hydraulic controlled feed rate, coupled with rapid air-powered advance and retract, and a full 3" drilling stroke, make the Bellows-Locke Drill Unit an important component in tool-room-built special purpose machines. Feed rate is infinitely adjustable from 0" per minute up to the maximum speed of the air-powered movement as determined by the air line pressure used.

The Bellows-Locke Drill Unit can be mounted horizontally, vertically, or at any angle. Its small size (21-1/16" long by 3¼" wide by 7-11/16" high) lends itself to space saving design. Used with a 1750 RPM motor, spindle speed range is adjustable from 690 to 4630 RPM through the Bellows Speed-Selector Pulley. (Motor and Speed Selector Pulley are optional.)



*This special purpose machine at The Perry-Fay Co., Elyria, Ohio, uses 8 Bellows-Locke Drill Units to drill twelve 7/32" holes in less than 1-1/2 seconds.*

As standard, the unit is equipped with built-in directional air valve with built-in solenoid, as well as manual start and stop controls. It is available with optional electric controls to provide deep hole drilling with automatic drill cleaning, or time controlled dwell. The Bellows-Locke Drill Unit can be factory equipped with any standard tapping head.

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**OF CALIFORNIA**
**733 E. PICO BLVD., LOS ANGELES 21, CAL.**

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# Western TRADE WINDS

## News about those who distribute and sell industrial equipment and materials

GEORGE L. COBB is promoted to position of general sales manager of *Soulé Steel Co.* He will direct sales of firm's Seattle, Portland, Los Angeles, and San Francisco operations. His headquarters will be at home office in San Francisco. He will fill post previously held by E. B. MCCLURE, who is now assistant to company's president. McClure's headquarters are in Soulé's Los Angeles plant.

*G. L. Cobb*

*R. G. Matthias*

*Pioneer Rubber Mills* transfers ROBERT G. MATTHIAS from central California valley area to Intermountain area as sales engineer in Utah, Wyoming, Montana and Colorado.

*Pettit Paint Co.*, Bellville, New Jersey, opens its new West Coast warehouse in San Leandro, Calif.

ROBERT W. LAWSON of *Ingersoll-Rand Co.'s* Butte office, is appointed company's branch manager in Salt Lake City.

RICHARD F. WALZ is appointed to administrative staff of Bendix computer division of *Bendix Aviation Corp.*, Los Angeles. He was formerly sales engineer with *Audio Products Corp.* of Los Angeles.

HENRY KERR of Albeni Falls, Idaho, is promoted from post of assistant sales manager to that of sales manager of *Diamond Match Co.'s* Northwest lumber division. He will be responsible for sales and merchandising of commercial lumber and other products of Diamond mills at Priest Lake and Albeni Falls, Idaho; Metaline Falls and Cusick, Washington; and Superior, Montana.

C. S. HARRIS is now export and Southwest regional sales manager for *Kelite Products, Inc.*, industrial cleaning chemicals manufacturer.

ROBERT W. JEFFERY is appointed general sales manager of *Currier Co., Inc.*, Oakland, manufacturer of industrial product finishing systems. He was previously manager of infra-red sales for *Fostoria Pressed Steel Corp.*

*Garrett & Shafer Engineering Works*, Seattle, is newly named *Allis-Chalmers* general machinery division distributor for Washington area.

Plans are under way for erection of an electronic tube warehouse in Los Angeles. Building, to be occupied by *General Electric Co.* under long term lease, will include, under one roof, sales offices, and engineering laboratory, commercial service offices and warehouse space. Area to be serviced includes California, Oregon, Washington, Idaho, Nevada, Arizona, Montana, Utah, and New Mexico.

Three new appointments are made in Western sales department of *American Potash & Chemical Corp.*, Los Angeles: HAROLD J. BENSINGER is named sales manager of heavy chemicals department; ALBERT F. SWAIN is appointed sales manager of agricultural chemicals department; and GEORGE A. SCHNIER becomes sales manager, refrigerants department.

*La France Precision Casting Co.*, Philadelphia, Pa., specialist in name plate field, opens a sales office at 3907 Duquesne Ave., Culver City. This branch office will take care of firm's sales in 11 Western states. W. G. BELLMORE is district manager.

ROBERT W. EVANS is appointed assistant director of public relations for *United States Steel Corp.'s* Western district. JOHN E. MATTOS is promoted to manager—heavy product sales, *Columbia-Geneva Steel* division, *United States Steel Corp.* He was formerly corporation's resident technical field representative at Stockton.

LEWIS F. PARSONS will serve as manager of *Western Gear Works* Spokane branch sales and engineering office which officially opened in early March. He comes from firm's Seattle plant, where he was on application engineering staff.

S. L. JACKSON is named district manager in Los Angeles office of *Electro Metallurgical Co.*, a division of *Union Carbide and Carbon Corp.*

*Production Equipment Co.*, Los Angeles, is appointed California distributor for portable McCoy Model 02-A-52 Metal Cutting Shear.

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New Southern California office of *F. Somers Peterson Co.* in Los Angeles now serves Southern California-Arizona area on following lines: *Veeder-Root, Inc.*, counting machines; *American Metal Hose Co.*, flexible metal hose; *Vaill Engineering Co.*, specialized equipment for aircraft; *Elliott Manufacturing Co.*, flexible shafting; *Kupfrian Manufacturing Co.*, push-pull controls; *Lowell Wrench Co.*, tools; *Parish Pressed Steel Co.*, truck and automotive frames.

*C. J. Hendry Co.*, ship chandlers and industrial equipment distributors in San Francisco, San Pedro and San Diego, receives a plaque from *J. H. Williams & Co.* for twenty-five year distribution of Williams' tools. Left to right are HENRY ARTRU, Hendry vice president; LELAND ADAMS, JR., Hendry president; JACK CINCOTTA, Hendry purchasing head; C. F. COATES, Williams' Western district manager; ADMIRAL COOLEY (ret.), assistant to Hendry's president, and DONALD ESINART, Williams' Northern California sales representative.

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*Republic Manufacturing Co.* of Cleveland names CARL H. DRENSKE, Van Nuys, Calif., as its direct factory representative. He will work in states of California, Washington and Oregon.

H. ALLEN THOMPSON, formerly with *Intermountain Equipment Co.* of Boise, Idaho, is named sales representative of *H. K. Ferguson Co.*, industrial engineers and builders. His office will be in San Francisco.

*Parker Appliance Co.*, Cleveland, Ohio, promotes DONALD T. BOODY, formerly Pacific Coast sales engineer for firm's industrial products, to head of newly opened Los Angeles office in *Parker Aircraft Co.'s* plant. Staff sales engineers for West Coast are: JAMES K. DYSART, R. H. WAGNER and E. M. YOUNG, Los Angeles; E. C. ROBINET, San Francisco; and D. N. ALLENSWORTH, Seattle.

R. M. STAMPLEY, of *Oliver United Filters, Inc.'s* Oakland, Calif., office, becomes local sales and engineering representative for company in Southern California, Arizona, Nevada and New Mexico. His new offices are located in Statler Building, Los Angeles.

Here are two changes in sales promotion staff of *Hyster Co.*, Portland, Ore. THORSTEN B. PEARSON is named administrative assistant and WILTON G. SMITH is transferred from Eastern division sales department to head up industrial truck promotional activities.

*Dallman Co.*, plumbing, heating and sheet metal supply distributor, appoints RALPH J. CRAWFORD as assistant sales manager, San Francisco branch, and names RICHARD O. AUSTIN assistant sales manager of firm's Sacramento plumbing and heating branch.

*Carl J. Kennedy Co.*, Los Angeles, is appointed Western representative for *Johnstone Pump Co.*, manufacturer of heavy duty barrel and bung hole pumps and wheel bearing presses.

WALTER E. WEYMAN, formerly sales manager and general purchasing agent for *Moffett Engineering Co.*, Albany, Calif., forms *Walter Weyman Co.*, Berkeley. Concern will serve as manufacturers representative and distributor for power, power transmission, and materials handling equipment in Northern California.

G. BURNETT MASON is appointed Northern California supervisor for *Westinghouse Electric Corp.'s* agency and construction department. He will guide sale, through distributors and agents, of Westinghouse electrical apparatus to industry.

*Kraloy Plastic Pipe Co., Inc.*, Los Angeles, names E. J. HALL its Western sales representative to service gas and water utilities and industrial firms.

I. NEWTON KIMSEY is made Western division manager of *B. F. Goodrich Co.* He will be responsible for concern's activities in Los Angeles, San Francisco, Seattle, and Denver.

ROBERT N. KELLY, assistant to sales vice president, is promoted to sales manager of *M and M Wood Working Co.*, Portland, Ore.

L. CARL FRAZER, formerly of Los Angeles office staff, becomes resident sales representative in San Joaquin Valley for all *Lufkin Foundry & Machine Co.* products. RAY MONROE assumes company's Los Angeles office responsibilities with duties directed toward supervision of equipment and shipping schedules and purchasing.

*The DoAll Co.*, San Francisco, is appointed by *Wade Tool Co.*, Waltham, Mass., as exclusive distributor in Northern California for Wade line of precision lathes, hand screw machines and bench profiler.

B. J. HERRON, manager of Los Angeles branch of *Independent Pneumatic Tool Co.*, Aurora, Ill., is appointed assistant to president for special sales development work in Johannesburg, South Africa. His duties in


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Los Angeles will be assumed during his temporary absence by W. J. LAUGHLIN.

VERNON A. SMITH retires as vice president in charge of sales, *Kenworth Motor Truck Corp.*, Seattle. ROBERT D. O'BRIEN, sales manager, takes over his duties.

R. L. HANES is appointed, by *Colorado Fuel & Iron Corp.*, its assistant to vice president in charge of sales. He was formerly manager of wire product sales with office in Denver.

*R. L. Hanes*

*D. Miller*

DAN MILLER becomes district manager of Northwest territory for *Square D Company*. Replacing him as industrial control sales manager is RICHARD L. RUSSELL, former Los Angeles territory sales supervisor. New district engineer for Pacific Northwest will be E. R. WALTON.

Under terms of an exclusive licensing agreement between *Pacific Airmotive Corp.* and *Rohr Aircraft Corp.*, PAC will now manufacture and sell Rohr tilting arcs. Manufacture will be handled by Burbank aircraft division. Aviation products division will handle sales on a national and international basis.

*Mailler Searles, Inc.*, division of *Emhart Manufacturing Co.*, San Francisco, is appointed sales representative for *Henry & Wright* and *V & O Press Co.*, also divisions of Emhart, for West Coast, Hawaii and provinces in Western Canada.

*The Valley Equipment & Supply*, Burbank, is named distributor for *Allis-Chalmers* motors, controls, transformers and drive equipment in Los Angeles County. WILLIAM C. HENDERSON is named sales representative in firm's Los Angeles district office.

Western sales and service facilities of White and Sterling White in West are in process of consolidation by *The White Motor Co.* Sterling headquarters in Los Angeles are moved to White's Los Angeles branch at 400 E. Washington Blvd. Sterling's San Francisco branch moves to White building at Fifth and Brannan Streets. White's Portland facilities will be increased with addition of new building and Sterling sales and service in this area will be brought under same roof.

ROBERT H. DAVIS, former field engineer for *Spinco Service Co.*, becomes manager of glass-apparatus and industrial glass-pipe sales in Los Angeles branch office and plant of *Glass Engineering Laboratories*.

*Balaam Brothers* is a new welding supply business featuring route delivery of supplies and consultation on welding problems. This Emeryville, Calif., firm is owned by ROBERT and NORMAN BALAAM.

*American Brake Shoe Co.*, Rochester, N. Y., manufacturer of air compressors and paint spray equipment, appoints L. D. BAX as its sales representative in Montana, Idaho, Wyoming, Utah, Colorado, Arizona, New Mexico and part of Nevada.

BAXTER F. BALL is named sales manager of *General Petroleum Corp.'s* marketing department. He will direct department's selling activities throughout seven Western states from headquarters in Los Angeles. A. E. HORN, JR., becomes manager of refinery sales, Northwest, with headquarters in Seattle. C. W. ELLIS is new Northwest division manager with headquarters in Portland. A. L. KNIPPING, JR., becomes manager of marine and traffic, and G. N. RAMSEYER is named manager of operations—both with Los Angeles headquarters.

*Alexander H. Kerr & Co., Inc.*, manufacturer of translucent structural panels, names *Kyle & Company*, with warehouses in Fresno, Stockton and Sacramento, as firm's Northern California distributor.

ALLEN C. STALEY, JR., of San Francisco is named assistant general manager of sales for *American Can Co.* He will be succeeded as manager of sales, Pacific division, by ROBERT C. STOLK, previously assistant manager of sales, Pacific division, whose job will be taken by C. W. CURRY of Chicago, now central division sales manager for Canco. G. S. SPENCE, formerly sales division manager in charge of fruit and vegetable commodities, Pacific division, is being transferred to general sales department in New York City. He will be replaced by B. C. PAULSON, San Francisco, formerly assistant sales manager of Northern California district. D. M. JOHNSON, of Los Angeles sales staff, will replace Paulson. WILLIAM FLYNN, Los Angeles, is named assistant district sales manager at Los Angeles. He succeeds ORVILLE H. CARY, transferred to San Francisco. Other Canco changes are as follows: ROBERT A. TURNER, San Francisco, to sales representative for fish canning industry in Los Angeles; CARLTON F. SARGENT, Los Angeles, to sales representative for citrus and fruit canning industry; and FRED M. AHRNERT, San Francisco, to Los Angeles sales staff.

Here are some personnel changes in Pacific Coast division of *Revere Copper and Brass, Inc.* BERNARD J. EGAN is appointed assistant to sales manager at Los Angeles. He is replaced as district sales manager at Seattle

*B. J. Egan*

*W. J. Scott*

*G. R. Fahey*

*W. E. Kalb*

by W. E. KALB, who transfers from San Francisco sales staff. WILLIAM J. SCOTT, previously a member of divisional sales department of Revere's aluminum division in Baltimore, is named assistant sales manager, aluminum sales, and GERALD R. FAHEY comes from Baltimore division to become technical advisor—both for Pacific Coast division.

JAMES H. PERRY is named vice president and sales manager of *P. & C. Hand Forged Tool Co.*, Portland.

A branch plant is being established in Portland by *Lowery Bros.*, Chicago, independent wire rope dealers. Wire products will be dstributed, through this outlet, to Washington, Idaho and Alaska.

ROY E. NIMTZ, formerly technical assistant with *P. G. and E.*, North Bay division, joins *Rockwell Manufacturing Co.* as sales engineer. He is attached to San Francisco office.

CARL C. CASTLE, Seattle sales representative for *Dow Chemical Co.*, transfers to Midland, Mich., headquarters where he will take a new position in organic chemical sales.

*Electro Metallurgical Co.*, a division of *Union Carbide & Carbon Corp.*, names S. L. JACKSON district manager in Los Angeles office.

JOHN F. ARTHUR, district manager of *United States Rubber Co.'s* San Francisco branch is appointed manager of U. S. truck tire sales. New manager of San Francisco


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branch will be RICHARD M. PAYSON, formerly manager of farm market sales. JOHN W. CARPENTER, New York district manager of Fisk-Gillette division, is named district manager of Denver branch.

*Copco Pacific, Ltd.*, San Carlos, Calif., distributor of Swedish rock drilling equipment, appoints CARLOS E. MILNER, JR., new district manager of its Phoenix, Arizona, branch office. Formerly associated with Silver Star Queens Mine of Hailey, Idaho, he now replaces JOHN F. KERVIN, who is recently appointed sales manager of *Copco Eastern, Ltd.*

JOHN BATCHELOR, *X-Ray Equipment Co.*, Salt Lake City, Utah, is appointed local representative for research and control instruments division, *North American Philips Co., Inc.*, Mount Vernon, New York.

MANFORD PATE, previously sales manager of tractor equipment division of *Hyster Co.*, is named national sales manager of *Honeyman Manufacturing Co.*, Portland, Ore. He will head an expanded distribution campaign of firm's line of hand trucks.

*Standard Pressed Steel Co.*, Jenkintown, Pa., opens a warehouse in El Segundo, Calif., to service 11 states and British Columbia in company's Pacific Coast sales territory. Three SPS salesmen to work out of this warehouse office are: JOHN G. MAHON, JR., JAMES C. HUMPHRIES and DAVID J. HURFORD.

WILLIAM J. WAGNER, recently of *Tuthill Pump Co.*, Chicago, is named sales manager of *Pump Engineering Co.* of Los Angeles. His main effort will be placed on centrifugal pump and blower applications.

*W. J. Wagner*

*G. W. Gilliland*

G. W. GILLILAND, Los Angeles sales representative for *Joseph T. Ryerson & Son, Inc.*, is newly named manager of firm's sheet and strip department.

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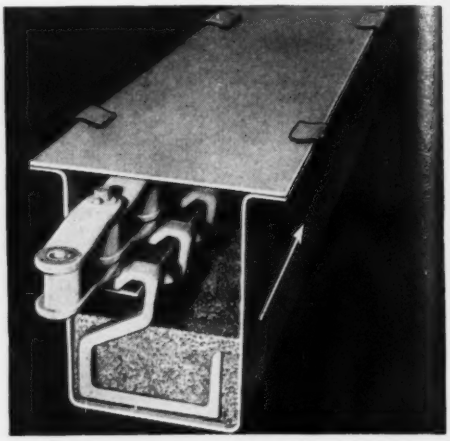

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